



The Sizewell C Project

6.3 Volume 2 Main Development Site Chapter 14 Terrestrial Ecology and Ornithology Appendix 14A8 Bats Part 3 of 5

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SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14, APPENDIX 14A8 – Bats:

Documents included within this Appendix group are as follows:

- **APPENDIX 14A8 BATS**
- **ANNEX 14A8.1 – FIGURES** (provided separately)
- **ANNEX 14A8.2 - DESK STUDY**
- **ANNEX 14A8.3 – METHODOLOGY**
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 - Annex 14A8.5 Amec Phase 1 Aldhurst Farm 2011
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 - Annex 14A8.5 Amec Coronation Wood Bat Survey 2012
 - Annex 14A8.5 Amec Sizewell Bat Survey Report 2007
 - Annex 14A8.5 Amec Sizewell Bat Survey Report 2008
 - Annex 14A8.5 Amec Sizewell Bat Survey Report 2009 (included in Part 2)
 - Annex 14A8.5 Amec Sizewell Bat Survey Report 2010
 - Annex 14A8.5 Amec Sizewell Bat Survey Report 2011 (included in Part 3)
 - Annex 14A8.5 Amec Sizewell Hibernation Survey 2011
 - Annex 14A8.5 Amec Upper Abbey Ecological Appraisal 2013

- [Annex 14A8.5 Royal Haskoning Sizewell Power Station ISFSI and Car Park Extension Ecological Scoping Report 2008](#)
- [Annex 14A8.5 Galloper Wind Farm Chapter 5 ES Terrestrial Ecology](#)
- [Annex 14A8.5 Sizewell Land Management Annual Review 2013](#)
- [Annex 14A8.5 Sizewell Land Management Annual Review 2011](#)
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- [Annex 14A8.5 Site Manager's Report May-Sep 2018](#)
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- [Annex 14A8.5 Sizewell B Annual Report 2017](#)
- **ANNEX 14A8.6 - PRIMARY DATA**
- [Annex 14A8.6 11H5.1 Hyder Cresswell 2013 Monitoring strategy](#)
- [Annex 14A8.6 Sizewell B Relocated Facilities Bat and Badger Technical Note \[CONFIDENTIAL, provided separately\]](#)
- [Annex 14A8.6 Sizewell B Relocated Facilities Bat Re-entry Emergence Survey 2019 Technical Note](#)
- [Annex 14A8.6 Bat Radio Tracking Drawings February 2016](#)
- [Annex 14A8.6 Bat Radio Tracking Report May 2016](#)
- [Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 \(included in Part 5\)](#)
- [Annex 14A8.6 Automated Bat Detector Monitoring Report 2013-2014 Figures](#)
- [Annex 14A8.6 Sizewell C Sandpits Technical Note \[CONFIDENTIAL, provided separately\]](#)

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NNB Generation Company

Sizewell Ecology Studies

Bat Survey Report 2011

January 2012

AMEC Environment & Infrastructure UK Limited

Report for

Christine Blythe
Biodiversity Manager
Barnett Way
Barnwood
Gloucester
GL4 3RS

NNB Generation Company

Sizewell Ecology Studies

Main Contributors

Matt Hobbs (BSG)
Lynn Whitfield (AMEC)

Bat Survey Report 2011

January 2012

Issued by

.....
Emma [REDACTED]

AMEC Environment & Infrastructure
UK Limited

Approved by

[REDACTED]
.....
Lynn Whitfield

**AMEC Environment & Infrastructure
UK Limited**

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

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Executive Summary

Baker Shepherd Gillespie (BSG) was commissioned to carry out bat surveys at the Sizewell Estate in 2011 as part of the baseline survey programme for bats that began in 2007. The 2011 surveys were designed to supplement and improve upon the existing baseline information with regard to all bat species, although the main focus of the surveys (as in 2010) was to investigate the status of barbastelle within the site.

The survey programme in 2011 included a continuation of activity surveys (both walked transects and static detector surveys) and roost surveys (surveys of Upper Abbey Barn and emergence surveys of known roosts) for all bat species present on site. Barbastelles *Barbastella barbastellus* were recorded regularly from walked transect surveys and from static detector surveys, being recorded from 57 of the 63 static detector deployments. The detectors (and transects) covered five discrete survey areas of the site twice (and three times for Area 5) during the season, enabling a comparison between activity levels in discrete areas of the site in the 'spring' (mid-April to late June) and 'summer' (July-early September). Although barbastelles used almost all areas of the site (as in 2010), the highest activity levels were recorded in foraging areas close to Ash Wood (particularly on the edge of Ash Wood and at Black Walks), Upper Abbey track, Goose Hill and the SSSI woodland area. Static bat detector surveys of Upper Abbey Barn showed that barbastelles roost there (probably in low numbers) particularly in May, June and late August/September, although it is thought unlikely to be a maternity roost. The surveys also showed that there is an apparent mating roost of Natterer's bat *Myotis nattereri* present in the barn, although the numbers of bats using this roost cannot be estimated accurately (see Section 3.4.1).

Detector survey results for other bat species were largely in accord with those from previous years' surveys in terms of the species and activity levels detected throughout the season. However, large numbers of serotine *Eptesicus serotinus* bats were seen and recorded in Goose Hill on transect surveys and very little Nathusius' pipistrelle *Pipistrellus nathusii* activity was recorded in the autumn after high activity levels recorded in the spring, in contrast to high levels during both migration periods in 2010.

The main focus of the survey programme in 2011 was a trapping and radio-tracking survey of barbastelle bats during 30 July-10 August with the aim of collecting data during the post-lactation period before maternity colonies begin to disperse and juvenile bats are flying. All trapped barbastelle bats, of an appropriate size and weight, were fitted with numbered rings to allow future monitoring of the population through mark-recapture studies. A small number of other species were also included on the licence for radio-tracking.

During the trapping survey a total of 148 bats from seven species were caught. Eighteen of the bats caught were barbastelles, including eight juveniles, seven breeding females and one adult male, of which 17 were tagged. In addition, four adult female Natterer's bats and one adult female brown long-eared bat *Plecotus auritus* were also tagged. As a result of the radio-tracking study, a total of 11 roosts, including 10 tree roosts, were identified as being used by barbastelles. Of these, nine were new in 2011 and two had been used in 2010. All of the tree roosts used by adult females and/or juveniles were located within (or on the edge of) the Sizewell Estate. Clusters of tree roosts were found in Ash Wood (4 roosts), in woodland at Plantation Cottages (2), the southern edge of Kenton Hills/ Leiston Carr (2) with additional roosts on the northern

edge of Kenton Hills, in Nursery Covert, in woodland near Leiston Old Abbey, and a barn to the west of the site (single male bat). No roosts were used in the Grove in 2011 despite three roosts being discovered there in 2010. The total number of roosts found over the two radio-tracking periods (June 2010 and August 2011) is now 23, of which 21 are tree roosts. The key roost areas in 2011 were Ash Wood and the new roosts near Plantation Cottages and Leiston Old Abbey. The characteristics of the roosts were similar to 2010 with large splits/fissures and loose/lifted bark favoured, with most trees being oaks *Quercus robur*. Females and juveniles were recorded switching between trees regularly, although the small size of woodland areas used for roosting and the relative position of most of the roosts found – i.e. on woodland edges - were not typical of the published parameters thought suitable for maternity colonies of barbastelle. However, unpublished and anecdotal evidence from England suggests that these roosts may not be atypical.

Following the discovery of a number of new roosts during the radio-tracking survey, simultaneous emergence surveys were carried out on all eight tree roosts during the survey, three of which had tagged bats roosting in them at the time. Although difficult viewing conditions hampering the collection of accurate counts a total of 13-27 individual bats were seen emerging. However, a combined total of 31 barbastelles was counted emerging from two trees on 2 August, which is the highest minimum population count to date.

The radio-tracking showed that there is a core foraging zone used by the juveniles and breeding female barbastelles that extends south from the woodland adjacent to Plantation Cottages through Black Walks, Ash Wood and into Goose Hill, Kenton Hills and the north-eastern part of the Sizewell Belts. It is suggested that this area may be a critical productive foraging zone which constitutes the juvenile and shared breeding female foraging areas as described by Greenaway (2004). Outside this core foraging zone there is a degree of overlap of foraging by both breeding female and juvenile barbastelle bats in peripheral areas such as Sizewell Belts. Whilst there does appear to be some partitioning of the foraging resource, there appears to be a high degree of overlap within the foraging areas used by individual members of the colony and a high degree of foraging site fidelity to the land within the Sizewell Estate. Overall, the reliance of the colony on the Sizewell Estate, and a core area within the Estate, appears to be high both in terms of foraging and roosting resources and the potential for impacts upon this population may be high if a large proportion of these key habitats are affected by the proposed works.

Radio-tracking of four adult female Natterer's bats led to the location of some new roost sites in Leiston Abbey ruins (with up to 49 bats seen emerging), Sandpytle Plantation, The Grove and a bat box in Leiston Hills (with 28 bats counted there). These roosts are in addition to the aforementioned mating roost at Upper Abbey Barn. A single brown long-eared bat was also tagged and tracked back to a maternity roost in a house 200m west of Sizewell Beach.

The updated evaluation of each bat species has remained largely unchanged from 2010 (see Section 5). Although there are uncertainties involved in evaluating the barbastelle resource associated with the site, barbastelle is considered to be rare in the UK, with a low number of maternity colonies discovered to date (see Section 2.6). The UK conservation status of barbastelle is therefore such that any breeding colony of this species would be regarded as of at least national (if not international) importance. For Nathusius' pipistrelle, the migratory population present in the spring and autumn appears to be of district or county importance and a breeding population (if present) within the Sizewell Estate would be of at least regional importance, given the scarcity of colonies of this species in the UK. For all other bat species, taking into account the survey results and known distributions/conservation status the value of the site is considered to be of local to district value.

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1. Introduction

1.1 Purpose of this Report

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate one or more new nuclear reactors. This area has an approximate central grid reference of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') has been commissioned to provide ecological services to support the development of new build proposals at Sizewell.

This report outlines the findings of survey work undertaken for bats during spring-autumn 2011, by AMEC and their subcontractor Baker Shepherd Gillespie (BSG).

1.2 Survey Area and Scope

The survey area and methodologies used have been adopted following ongoing consultation with statutory and non-statutory consultees and stakeholders, taking into account best practice guidelines, site specific and project specific characteristics and professional judgement. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals.

1.3 Legislation and Policy Guidance

A list of national and local policies and legislation that relate to bats is provided below and full details can be found in **Appendix A**.

- Planning Policy Statement 9;
- UK (and Suffolk) Biodiversity Action Plans;
- Natural Environment and Rural Communities Act 2006;
- Wildlife and Countryside Act 1981;
- Countryside and Rights of Way Act 2000; and
- Conservation of Habitats and Species Regulations 2010.

1.4 Status of Bats in Suffolk

A new combined Suffolk BAP for bats is due for completion in autumn 2011. Although this had not been issued at the time of writing some unpublished data from the draft BAP for bats was provided by the Suffolk Biodiversity Partnership and is included in **Appendix A**.

1.5 Barbastelle Status in the UK and Europe

The barbastelle is rare in Britain (Battersby, 2005), and only sparsely distributed through its range in Europe (Altringham, 2003), with populations categorised as vulnerable (IUCN, 2006; EU Red List). The most recent official population estimate is of 5,000 animals in the UK (Battersby, 2005). However, the population count is based on very limited data and more recent studies indicate that the true figure may be anywhere between 5,000 and 10,000 (Harris & Yalden, 2008). The National Bat Monitoring Programme (NBMP) does not yet hold sufficient data to calculate population trends for barbastelle, although this may be possible in 2011 (Briggs¹ 2011, pers. comm.). The NBMP Woodland Survey does include surveys for barbastelle, which until 2010 were conducted at a total of 22 sites, of which seven are Special Areas of Conservation (SACs) designated for barbastelle. Barbastelle have been recorded at two of these in addition to the SACs (Bat Conservation Trust (BCT), 2010). During 2010, the survey was extended to a further eight sites although preliminary data have only been published for the seven SAC sites so far, with barbastelles recorded at all seven during the NBMP survey. Data collated by the Barbastelle & Bechstein's Technical Advisory Group from the NBMP gives the number of 10km squares occupied by barbastelle as 86².

There are no published figures for the number of maternity colonies since a quoted figure of five in the UK in 2001 (Greenaway, 2001). However, at least 17 sites which support maternity colonies are known in the UK at the time of writing. Seven of these are within six SACs for which the barbastelle is a primary reason for site selection, and one is within a SAC for which it is listed as a qualifying feature. In addition there are another six sites for which there is an online reference and another which is known to the author and is currently confidential. More details of these sites can be found in **Table 1.1**. There are apparently no published data for any other maternity colonies, although it is known to the author (through anecdotal accounts) that more colonies (both confirmed and unconfirmed) than are listed in **Table 1.1** have been located in recent years as studies of the species have increased.

The lack of population data is due largely to the rarity of the species, the difficulty in finding roosts of this species and the difficulty of detecting them using aural bat detectors. Although barbastelle are likely to be an under-recorded species it is thought to be a rare species under threat throughout Europe (Dietz *et al.*, 2009).

Their characteristic short and directional echolocation call (Denzinger *et al.*, 2001), and fast and far-travelling flight (Dietz *et al.*, 2009) make barbastelles difficult to hear and identify using bat detectors during transect surveys. In addition, barbastelles are now known often to emit calls which are very quiet, 10-100 times lower in amplitude than those of other aerial-hawking species of bats. They are thought to employ this strategy in order to remain undetected by eared moth species which form their principal prey resource (Goerlitz *et al.*, 2010). Recent research has also shown that their low amplitude calls are only detectable at short ranges by bat detectors (see Section 2.5) and that, as a consequence, they are a difficult species to survey for.

¹ Phillip Briggs is Monitoring Projects Manager for the Bat Conservation Trust.

²http://www.ukbap-reporting.org.uk/status/species_habitat_nat_status.asp?X=%7BE92537EC-5F7F-4536-B8FA-A074508DFDCF%7D&C=1&txtLogout=&flipLang

Table 1.1 Confirmed Barbastelle Maternity Colonies in the UK

Site name	County	Year of discovery	Designated?
Paston Great Barn	Norfolk	1996	SSSI, SAC
Ebernoe	West Sussex	1996	SSSI, NNR, SAC
Horner Wood	Somerset	1999	NNR, SAC (Exmoor and Quantock)
The Mens	West Sussex	2000?	SSSI, SAC
Pengelli Forest	Pembrokeshire	2000	SSSI, NNR, SAC (North Pembrokeshire Woodland)
Eversden and Wimpole	Cambridgeshire	2002	SSSI, SAC
Hawns and Dendles	Devon	2002	SSSI (Dendles Wood) NNR, SAC (Exmoor and Quantock)
Mottisfont	Hampshire	prior to 2003	SSSI, SAC
Mocca's Park	Herefordshire	2003	NNR, SSSI
Tinker's Hill Wood	Worcestershire	2003	SSSI
Briddlesford Woods	Isle of Wight	2004	SSSI, SAC (not a qualifying feature)
New Forest	Hampshire	2006	Within New Forest NNR, SAC (not a qualifying feature)
Whichford Wood	Warwickshire	2008	SSSI
Parkhurst Forest	Isle of Wight	2009	SSSI
Location not available	Norfolk†	2009	
Chambers Farm Wood	Lincolnshire	2010	Part of Bardney Limewoods SSSI/NNR
Location not available	Cornwall*	Unknown	

* Information from Cornwall Bat Group website. † BSG, unpublished data.

1.6 Summary of Baseline Survey Work, 2007-2010

The bat surveys carried out in 2011 are part of the baseline survey programme for bats that began in 2007. Survey work was carried out in 2007 (report ref: 19801cb114), 2008 (report ref: 19801cb205), 2009 (report ref: 19801ca405) and 2010 (report ref: 28130ca68). Details of the results of the survey work and supplementary desk study can be found in the relevant reports and are summarised below.

From the desk study undertaken in 2007 and 2009 and conversations with the Wildlife Trust and local householders, there are known to be a number of bat roosts within the Sizewell Estate which include small roosts of Natterer's bat (Upper Abbey Barn), brown long-eared bat (the Wildlife Trust workshop and Ash Cottages), common pipistrelle *Pipistrellus pipistrellus* and soprano pipistrelle *Pipistrellus pygmaeus* (Upper Abbey Barn and bat boxes in Kenton Hills), noctule *Nyctalus noctula* (small numbers in bat boxes in Kenton Hills – which can include hibernating bats) and barbastelle (some anecdotal records from Upper Abbey Barn and Lower Abbey).

Ten³ species of bats have been recorded during bat activity and trapping surveys: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, brown long-eared bat, Natterer's bat, Daubenton's bat *Myotis daubentonii*, noctule, Leisler's bat *Nyctalus leisleri*, serotine and barbastelle.

During 2007-2009 barbastelle bats were recorded on most areas of the site that were surveyed, with the greatest frequency in the areas of plantation woodland (Kenton Hills, Goose Hill) and lesser frequency in the area of Sizewell Belts and the arable land to the north of the plantation areas. The highest level of activity was recorded (in 2009) along the track between Fiscal Policy and Upper Abbey and the timing of records suggested that this feature may be a commuting corridor for the species. During a trapping survey over three half-nights in May 2009 five barbastelles, of which four were females, as well as another 42 bats of six species, were caught. Although it was not possible to say whether the females were pregnant, at least three had bred in previous years. This information suggested that the site may be of importance to breeding female barbastelles.

The main focus of the survey programme in 2010 was a trapping and radio-tracking survey of barbastelle bats during the period 1-12 June. The survey programme also included a continuation and intensification of activity surveys (both walked transects and static detector surveys), roost surveys (bat box checks and emergence surveys of known roosts) for all bat species present on site, and an inspection of trees for potential to support bat roosts, covering all areas thought likely to be affected by development proposals at that time.

During the trapping survey a total of 177 bats from eight species were caught, including nine barbastelles, of which seven (six pregnant females and one male) were radio-tagged and tracked. A total of 13 roosts, including 12 tree roosts used by pregnant females, were found during this study, and 11 of the tree roosts were located within the Sizewell Estate. Clusters of tree roosts were found in Ash Wood (3), The Grove (3) and along the north edge of Kenton Hills and Nursery Covert (3) with additional roosts in the Grimseys area (which was not accessible), Hangman's Wood, Greenhouse Plantation and a barn to the west of the site (single male bat).

During activity surveys (including night-time tracking) barbastelles were recorded using a variety of habitats including Sizewell Belts (particularly the northern section), both broad-leaved and plantation woodland, parkland and farmland (both pasture and arable) and the highest activity levels were recorded along commuting and foraging features close to Ash Wood (on woodland and arable edge, particularly at Black Walks), Upper Abbey track, Goose Hill, the perimeter track around Kenton Hills and Nursery Covert, Fiscal Policy and Leiston Old Abbey.

Detector survey results for other bat species were generally in accord with those from previous years' surveys; however, greater Nathusius' pipistrelle activity was recorded in 2010, principally during the likely migration period in spring and autumn, but also in the summer months. This could indicate a resident population, as well as a transient migratory population.

Over 450 trees considered to have medium or higher potential to support roosting bats were identified during a tree inspection undertaken in 2010. The results of this survey show that there are a number of blocks of broad-leaved woodland within or near to the site that are suitable for

³Note that earlier reports included a few detector calls which were erroneously reported as being from whiskered bat; however, these should have been included simply as '*Myotis*', as it is not possible to distinguish with certainty between the whiskered group and other *Myotis* species on this basis.

supporting maternity colonies of barbastelle as well as roosts of other species of bats. Large clusters of suitable trees were found in Ash Wood, The Grove and Fiscal Policy, and around Leiston Old Abbey, Grimseys and the eastern edge of the Sizewell Belts SSSI.

1.7 Aims of the 2011 Survey Work

The surveys were designed to supplement and improve upon the existing baseline information with regard to all bat species, although the main focus of the surveys (as in 2010) was to investigate the status of barbastelle within the site and the detailed aims of surveys are given under the headings below. **Activity Surveys**

The general aims of the surveys for all bat species were to continue the baseline survey carried out in 2007-2010 and to target survey effort in some new areas given the evolving design for the scheme. The key purpose of activity surveys was to examine spatial and temporal patterns of bat activity, and to identify areas of high importance for bats through quantitative analysis of relative activity levels between survey areas and survey periods (see Section 2.1).

Trapping and radio-tracking studies

Barbastelle

A trapping and radio-tracking survey was carried out in 2011 to supplement data collected in June 2010, and therefore provide a more coherent and robust baseline for the Ecological Impact Assessment (EcIA). Surveys were scheduled for August in 2011 to provide data from the end of the breeding period before maternity colonies begin to disperse and juvenile bats are flying. The key aims of these surveys in 2011 were as follows:

- To track juvenile bats and ascertain their core foraging areas;
- To confirm if activity patterns and home ranges of adult bats vary through the maternity period, through comparison with the 2010 data;
- To confirm if bats used different areas for foraging in the summer, through comparison with the 2010 data; i.e. barbastelle activity in Goose Hill appears to increase substantially from spring to summer (from static bat detector records).
- To locate additional roosts used by this species given their preference to use many different roosts and to move frequently between them; and
- To provide further roost counts and a more accurate minimum population count for the site/colony.

All trapped barbastelles, of an appropriate size and weight, were also fitted with numbered rings to allow future monitoring of the population through mark-recapture studies. The ringing of barbastelles at Sizewell will provide data that (given a suitable survey design, lack of bias and certain assumptions) should enable more accurate estimates of abundance and therefore population size. The data may also help to establish other parameters relevant to studies of population dynamics, such as longevity, fecundity, survival rates and inter-annual site fidelity. This technique could be used at Sizewell to provide further suitable baseline information for assessing the long-term impact of construction on barbastelles (and potentially other bats) and may be considered as part of a long term monitoring programme for bats at Sizewell.

Nathusius' Pipistrelle

This is a species which is regularly detected in small numbers across the country in spring and autumn, a pattern that is consistent with migration of individuals to the continent in spring and from the continent (to hibernate in Britain) in the autumn (Russ *et al.*, 2001). In 2009 there were a small number of detector records of this species at Sizewell in April and May. However, during 2010 a large number of passes were recorded in April/May and August/September; coinciding with the period when this species would be migrating. Significant activity was also recorded in June and July in the area of the northern Belts, suggesting a resident summer population and raising the possibility of breeding roosts being present. As only a small handful of maternity colonies are known in mainland Britain, these would be of high conservation importance. For this reason, Nathusius' pipistrelle was included on the radio-tracking licence to include provision for detecting lactating female/juvenile Nathusius' pipistrelle soon after the end of the maternity period, which would indicate a local breeding population.

Other Species

Radio-tracking of other, selected bat species was also included on the survey licence in 2011. The surveys also included emergence surveys of roosts that contained tracked bats. The rationale for including these species was to collect adequate information on all bat species present at the site. The following species were included as target species for radio-tracking in the 2011 season:

- Natterer's bat: although a suspected maternity colony has already been identified on the site (using Upper Abbey Barn), activity patterns detected in 2010 suggest that there may be other colonies of this bat using woodland areas for roosting;
- Daubenton's bat: although only a few male bats were caught during the 2009 and 2010 trapping sessions, the aquatic and woodland habitats present on site are suitable for this species and further survey to establish whether or not maternity roosts are present would be of value to the EcIA;
- Brown long-eared bat: again, while some building roosts are already known, information on further roosts and particularly the use of tree roosts would be of value to the EcIA.

Radio-tracking of Leisler's bat is not considered necessary at this time. Although an apparently scarce bat in mainland Britain (and in Suffolk) no bats of this species have been caught during trapping surveys and they appear to be sparsely distributed across the site. The timing of recorded echolocation calls during the night also indicates that the site is not near to any colonies of this species and/or that the site is only of moderate importance for foraging.

2. Methods

2.1 Selection of Survey Periods and Areas

2.1.1 Trapping and Radio-tracking Surveys

For this survey method a precise survey area was not defined as the survey aimed to describe the areas used by barbastelle bats that were likely to be potentially affected by the proposed works, i.e. those foraging or roosting in the Sizewell Estate (as a general area). Trapping locations were all within the Estate as this increased the chance of catching bats that use this general area. As a result, priority was given to tracking those tagged bats that remained within the Sizewell Estate. However, it was important to demonstrate the degree of fidelity that individual bats showed to the Estate and if tagged bats left the site they would be followed until surveyors could no longer locate a signal from a bat's tag. Also, if no tagged bats were in the Sizewell Estate area then surveyors would search for bats in the wider area.

2.1.2 Walked Transect and Static Bat Detector Surveys

The 2011 survey area for walked transect and static bat detector activity surveys was split into five sub-survey areas which enabled comparison between bat activity in different parts of the site. These areas differed from those used in 2010 although there was considerable overlap in the survey areas used in 2010 and 2011 and the new areas were included to reflect the evolving design of the proposed scheme. The survey area was designed to cover the latest red line boundary of the proposed works, as well as peripheral areas that may also be affected by the proposed works, at least twice a year to look for seasonal differences in bat activity and also to both complement and fill any gaps in the radio-tracking data for barbastelle. The five sub-survey areas used in 2011 are shown on **Figure B1**⁴ and cover five areas of the site (listed below). The difference between the extent of the overall survey area used in 2010 and 2011 is shown in **Figure B2**.

Area 1 – Ash Wood and farmland (north-west)

This includes Ash Wood and several arable fields to the south, west and north of the wood as well as a shelter belt/hedgerow to the north of Ash Wood, part of Black Walks and the northern part of Upper Abbey track.

Area 2 – Farmland (north-east)

This includes a number of arable fields as well as The Grove and young pine plantation between Ash Wood and The Grove.

⁴Table and figure numbers preceded with a letter can be found in the relevant appendices (A, B etc.).

Area 3 – Farmland (west)

This includes a wide area of arable farmland to the north of plantation woodland at Kenton Hills and west of Upper Abbey Barn and two pasture fields west of Upper Abbey track. It also includes Upper Abbey Barn and much of Upper Abbey track.

Area 4 – Goose Hill

This includes all of the plantation woodland at Goose Hill as well as two small arable fields to the north-west and Stonewall Belt.

Area 5 – The Belts (south-east) and Main Site

This includes the north-eastern section of the Belts, part of the SSSI woodland as well as the main site and adjacent bunds.

2.2 Trapping and radio-tracking surveys

2.2.1 Licensing and Personnel

A licence for the trapping and radio-tracking survey was granted to Helen Lucking of Corylus Ecology by Natural England (licence number 20112929) with ringing to be undertaken by Geoff Billington of Greena Ecology. Two key accredited agents were part of the trapping and radio-tracking team: Alastair Wrigley of Corylus Ecology and Geoff Billington. A number of other surveyors employed by Corylus Ecology were used as accredited agents during the trapping and for radio-tracking. All radio-trackers were experienced in such work. The key night-time radio-tracking surveyors used were experienced in multi-bat tracking projects for development and road schemes, each having a minimum of six years' experience of similar, sustained trapping and tracking surveys. Experienced day-time surveyors were used to track bats back to day roosts. Seven surveyors worked on the project with assistance from a small number of staff from BSG.

In addition, as a requirement under the Natural England licence for the radio-tracking, the local bat group representatives were contacted, in this case the local Suffolk Wildlife Trust team, to inform them of the work and to check whether any other radio-tracking was being undertaken by other surveyors who should also have contacted the same bat group representatives. No such concurrent studies were reported.

2.2.2 Trapping Dates, Locations and Methods

Harp-trapping⁵ and mist-netting with additional hand-netting from tree roosts was undertaken between 30 July and 3 August with radio-tracking continuing until 10 August 2011.

Locating the traps was largely based on experience from 2010 and in most cases the same trapping locations were used as there are a limited number of suitable trapping locations on the Sizewell Estate, on flightlines that are used regularly by target species and where bats find it difficult to evade capture, i.e. on rides where there is dense vegetation both above and to the sides. Some trapping locations were dropped from 2010 where they were unsuccessful, i.e. at T5 (Ash Wood), T6 (Broom Covert) and T7 (Reckham Pits Wood). The use of a three-tiered 10m -

⁵ Austbat harp traps were used.

high mist net (sky net) in coniferous plantation woodland (the southern edge of Goose Hill) enabled trapping at two new locations at the southern edge of Goose Hill (T8 and T9; see Section 3.1.1), where trapping using standard nets was unlikely to be successful.

Sky nets incorporate three standard mist nets which are combined into a three-tiered trap which covers an area 9-12m wide and approximately 7.2m high. The net was used as it allowed coverage of the space between the ground and canopy height, allowing effective trapping on wide rides with high canopies such as those in the coniferous plantation at Goose Hill. Even using a sky net, there are a large number of flightlines that are regularly used by barbastelles on the Sizewell Estate which are unsuitable for trapping (e.g. most of Goose Hill and Kenton Hills/Nursery Covert, Sizewell Belts and all arable and pasture habitat). At emergence times surveyors also attempted to catch bats from roost trees using static hand-nets and a cone trap where placement was possible. Trapping from roosts may enable rapid capture of large numbers of bats during emergence (see Section 3.1.1).

Two acoustic lures (Sussex Autobat) were used to improve trapping efficiency, although problems with the speakers meant that both were not available for use during the whole of the trapping period. The lures played a synthesised barbastelle or Nathusius' pipistrelle social call and were used near to harp traps (HTs) on a number of evenings specifically to attract those subject bats. The lures were used on the following occasions:

- 30 July – barbastelle lure on two harp traps (set together) at Fiscal Policy (T1);
- 31 July – barbastelle lure on a harp trap at Turf Pits (T2);
- 1 August – barbastelle lure on two harp traps (set together) at Upper Abbey track (T3);
- 2 August - two lures were used, one on two harp traps (set alongside) and one on a single harp trap at Sandling's Walk (T9). The lures played barbastelle and Nathusius' pipistrelle calls alternately; and
- 3 August – Nathusius' pipistrelle lure on two harp traps (set alongside) at The Grove (T4).

Biometric data were recorded from all bats caught, including the gender, forearm length and weight. Every bat was also examined to ascertain its age and breeding status, where possible.

A Tinytag temperature datalogger was installed in Fiscal Policy from 30 July 2011 until the end of the survey to monitor the temperature range during the survey and surveyors also noted changes in temperature when it became particularly cold or there were significant weather events such as rain or strong winds.

2.2.3 Marking and Radio-tracking Methods

Only bats in healthy condition and of suitable weight were considered for tracking/ringing. Bats were tagged with radio-transmitters provided by Biotrack and were ringed using standard rings provided by the Zoological Society of London. Tags weighed 0.47g, 0.35g or 0.28g and the licence granted from Natural England allowed tags up to a maximum of 7% of the bat's body weight to be used.

A total of 17 barbastelles were fitted with tags weighing between 4.2% and 6.1% of their body weight. Brown-long eared and Natterer's bats were also tagged, the weight of the tags fitted to

these bats ranged from 5% to 6% of their body weight. The tags were glued between the shoulder blades, after clipping fur from the area, using Salts Latex Adhesive Solution 833005⁶ adhesive. The 0.47g and 0.35g transmitters used were designed with a battery life of at least eight days with the 0.28g tags set for five days. Time was allowed for the bats and transmitters to settle and for receivers to be set to the optimum frequency of each transmitter before releasing the bats close to where they had been caught. Each tracked bat was assigned a consecutive number to allow them to be distinguished easily during tracking.

Bats were radio-tracked using Australis and Sika radio-tracking scanning receivers with Yagi rigid directional aerials to track bats on foot. Whip omnidirectional antennas were employed when searching for bats by vehicle. Hand-held sighting compasses were used to take bearings, and detailed maps and handheld GPS units were used to provide locations for both surveyors and bats. Between two and seven surveyors were used to radio-track the bats with both close-tracking and synchronised triangulation techniques used to produce joint bearings. Surveyors used long range MITEK radio-sets and mobile phones to allow contact to be maintained while synchronised joint bearings were taken. Care was taken to ensure that tag frequencies would not overlap. Bats were tracked throughout the night until they went out of range of surveyors and then tracked by surveyors during the day who attempted to find their roosting locations. A series of safe observation points for the radio-tracking surveyors were pre-planned to allow for safe working and to provide the best receiver locations for joint bearings to be taken.

As the principal aim was to determine whether bats were using areas likely to be affected by the scheme proposals, tracking effort was concentrated within the Sizewell Estate, and female and juvenile bats were prioritised. The radio-tracking effort was spread over a number of bats to give an insight into the behaviour of a number of individuals. When radio-tracking a larger number of bats simultaneously, this will mean that some bats will not be recorded at times when other bats are being recorded and vice versa. However, the benefit of this approach is that a larger proportion of the colony is radio-tracked, and the risk of information on the extent of the colony's use of the study area being missed is reduced.

If a bat was recorded, attempts were made to take synchronised, also referred to as "joint", bearings with another surveyor at a different location, and triangulation used to pinpoint ("fix") the bat's location. Where a surveyor had a high degree of confidence in a bat's location but could not achieve a joint bearing with another surveyor single point estimates of locations were noted. Where a bat was closely radio-tracked, for example a bat foraging for a sustained period within a specific area, a triangulation point was generated for the approximate centre of the foraging area with a separate triangulation point generated for every ten minute interval to avoid autocorrelation (see Section 2.10.1).

2.2.4 Data Analysis

Bat fixes were transferred to digital geo-referenced maps using AutoCAD (Autodesk Inc., 2010) and coordinates for triangulation points were determined; the extent of bat activity for each bat was plotted independently and the data were carefully scrutinised and any obviously false bearings discarded. The coordinates of the plotted triangulation points for all bats were then

⁶Current guidance from the Bat Conservation Trust suggests that the new formulation of SkinBond adhesive, a previously preferred adhesive brand, may not be safe for use with bats. The adhesive used during surveys at Sizewell was a latex based formula which has been used successfully by other UK consultants and the RSPCA.

transferred into Ranges 7 software (South *et al.* 2005) and analysed to produce minimum convex polygons⁷ (MCPs), neighbour linkage⁸ (or clusters) and kernel contours⁹. These are all methods of showing home ranges¹⁰. For all bats whose roosts were found, the roost sites were included within the home ranges. The analysis was carried out using the 95% of the locations closest to the home range centre (for polygons produced by MCP analysis) or the 95% nearest to each other for the contour analysis (the cluster and kernel contours). Additional coordinates for areas where no joint bearings had been obtained, but where close tracking had been undertaken, were also calculated. Such additional data were combined with the triangulation data to create a separate data set for re-analysis within Ranges 7.

Within each data set, the trapping locations were specified as the focal sites and all coordinates from the night-time and day-time tracking and roost locations were inputted as location qualifying variables (LQVs) within Ranges. Typically a focal site might consist of a den, nest or roost of a tracked animal. In the case of the bats tracked during this study, since animals regularly switched day roost, the roost could not be used as focal site within Ranges 7; hence the location where the animal was caught was used to ensure consistency of approach.

In the general sense, the accuracy of a home range analysis ought to increase as more data points (fixes) are achieved. In the case of kernel analysis a minimum number of 30 fixes is required to prevent an over-estimation of home ranges (Millsbaugh and Marzluff, 2001), and where possible, a greater number of fixes than this was achieved, with surveyors aiming to achieve 50 fixes for each bat. However, for MCP and cluster analysis it has been suggested that more than 100 fixes are required to obtain reliable estimates of home range size. Therefore although all three analysis techniques are compared in this study, and the validity of the home range calculations is discussed (see Section 3.1.5), detailed statistical analysis relating to variation in home ranges or core areas has not been undertaken. However, as stated above, the fixes obtained have allowed a description of the areas used by each tagged bat to be made.

2.3 Walked Transects

Twelve walked transect surveys were undertaken between April and September 2011. During each transect survey two surveyors together (for health and safety reasons) walked a pre-determined transect route in one of the sub-survey areas (1-5). Areas 1-3 were surveyed twice during the season and Areas 4 and 5 were surveyed three times. An additional transect was undertaken for Areas 4 and 5 to allow more detailed assessment of areas that form part of the core foraging area for barbastelle and may be subject to significant loss of high quality habitat (particularly Goose Hill and the Sizewell Belts) as a consequence of current proposals.

⁷ The MCP enables the creation of a boundary around all fixes using the smallest possible convex polygon. This is commonly used but may overestimate the size of home ranges.

⁸ A type of multivariate analysis which aims to group a set of variables or individuals into classes, so that the objects in each class are as like each other as possible and as unlike the other classes as possible, as defined by a designated list of characteristics and indicators.

⁹ Kernel methods quantitatively determine areas which are intensively used by animals by converting position coordinates into lines or areas with varying probabilities of use and present these graphically.

¹⁰The area in which an animal normally roosts and forages.

Each survey visit started around sunset and typically took 2.5-3 hours to complete, although one survey of Area 5 was carried out during the two hours prior to sunrise due to poor weather during the previous evening. The same (or a similar) transect route was walked on each survey visit with the start and end points changed on each visit to ensure that different parts of the site were surveyed at different times of the night. This approach was adopted to remove a bias that could be introduced if any given point on the transect route was always sampled at approximately the same interval after sunset. In addition, on most transects, surveyors completed two circuits of the route to ensure sampling at each point at two different intervals after sunset. Surveyors used two different bat detectors on every survey: a Batbox Duet or BatBox Griffin detector for listening to bat calls from the combined heterodyne/frequency division output, and an Anabat SD1 or SD2 frequency division detector for recording calls for subsequent identification (see Section 2.5). Wherever possible, surveyors recorded the observed behaviour and numbers of bats onto field proformas. Notes were taken of all bat sightings (to assist with their identification) in conjunction with the Anabat recordings. Field notes included a record of the time of each bat encounter, allowing results to be cross-referenced with the recorded data.

2.4 Static Bat Detector Survey

2.4.1 Survey Approach

Anabat bat detectors were used to assess bat activity at various fixed points throughout the site. The detectors were left *in situ* for a number of days or weeks at each survey point, which allowed continuous monitoring to take place during the period when bats are active. They were programmed to begin recording half an hour before sunset and finish half an hour after sunrise. Survey hours therefore varied throughout the survey season according to night length.

Six detectors were deployed for 2-3 weeks in one survey area before being moved to another six survey locations in a different survey area. This was continued throughout the survey period with a total of 11 deployments (of six detectors) completed. In the majority of cases detectors were placed in a consistent location within each sub-survey area on each deployment throughout the survey period. However, detectors 2a and 4c were moved between periods. Detector 2a was located in woodland within the SSSI in April (spring) but had to be moved due to the area being overgrown and inaccessible in summer. Detector 4c was moved between spring and summer as the detector had recorded low levels of activity and had been interfered with in its first location.

Detector locations were chosen largely because high levels of bat activity had been recorded at them in 2010 (when detector locations were not fixed between recording periods) or because 2010 radio-tracking data indicated that they may be important for commuting or foraging barbastelle. The rationale for selecting detector positions for each sub-survey area is explained below:

Area 1 - Ash Wood and Farmland (north-west)

This was informed by the proposed location of temporary works compounds to the south of Ash Wood and by the need to show how barbastelles disperse into the landscape from roosts in the wood. Two of the locations were also used in 2010 (4a and 4e).

Area 2 – Farmland (north-east)

Selection focussed on determining commuting routes used by barbastelles between Ash Wood and The Grove (the two key maternity roost areas identified in 2010). Two of the locations were used in 2010 (5a and 5b).

Area 3 – Farmland (west)

Selection focussed on sampling representative habitats within the area, including the arable fields in the centre of the site (3e and 3f), Upper Abbey track and the edge of Leiston Old Abbey (3c and 3d) and two new set-aside fields in the west of the site (3a and 3b) that were included in development plans in 2011. Four of the locations were the same or very similar to those used in 2010 (3c-f).

Area 4 – Goose Hill

Selection was similar to 2010 with detectors placed on rides and movement corridors throughout Goose Hill. Four locations (1a-d) were the same or very similar to those used in 2010 and two were in new but similar areas to 2010 (1e-f).

Area 5 – The Belts (north-east) and Main Site

Selection was similar to 2010 with three locations on the Sizewell Belts the same as 2010 (2b-d) and one new (2a). One was the same for the main site (2e) with two new locations along the bund near the coast (2f and P3 1g).

The survey period was split into two key periods, 12 April – 19 June (period 1, “spring”) and 20 June to 5 September (period 2, “summer”) with an additional period during 6-28 September (period 3, “autumn”) covering just one additional deployment in Area 5. Each detector was numbered according to period, deployment number and location, e.g. P1 1a. The extra deployment in Area 5 in September was intended to cover the key migration period for Nathusius’ pipistrelle and the highest activity levels for this species in 2010 were recorded in this area in May and late August-early September.

2.4.2 Deployment of Anabat Detectors

Anabat bat detectors were placed in camouflaged waterproof boxes with a 12V battery attached. The microphone was attached to a 2m cable which was connected to the detector. The microphone was housed inside a sealed curved pipe to keep water off the microphone without incurring significant loss in sensitivity. With the microphone pointing downwards at 45 degrees, the 90 degree bend in the pipe allows reception of calls from the upward-pointing, open end of the pipe. The pipe was then attached to a hedgerow, tree, or other suitable habitat feature with the Anabat housing hidden on the ground. The pipes were positioned at 1-2m height without any solid objects present close to the microphone to prevent interference or impedance to recording bat calls. Wherever possible, the microphone was pointing across, rather than along a potential commuting or foraging feature to avoid any bias that may occur if the detector was pointing along a feature and recording more bats travelling in a particular direction (i.e. when commuting). The detector and microphone housing used at Sizewell has been tested in an acoustic laboratory at Bristol University using playbacks of calls from UK bat species. The housing has been shown to record bat calls with only small apparent reductions in sensitivity of less than 10% in comparison to a microphone with no housing (BSG, unpublished data).

2.5 Recording Bat Activity

The Anabat SD1 and SD2 frequency division bat detectors were used to record bat calls during walked transect and static bat detector activity surveys. The Anabat provides a frequency down conversion which generates audible audio signals with frequencies directly related to those the bat is producing.

The likelihood of detecting bats acoustically depends on the propagation of sound through air, the characteristics of bat calls, and the way sound is received and processed by the bat detector. Recent collaborative research by BSG and Bristol University has shown that bat detectors detect calls from some species of bats at greater distances than others. In general, bats with calls that can be detected over greater distances are larger bats which use calls that are both high amplitude and low frequency such as the noctule and the most difficult to detect are those which use low amplitude calls, such as the brown long-eared bat and barbastelle, or high frequencies, such as horseshoe bats *Rhinolophus* spp. **Table 2.1** shows the mean frontal detection range of Anabats for echolocation calls from UK bat species based on research undertaken by BSG in collaboration with Bristol University (Holderied *et al.*, unpublished data).

Table 2.1 Estimated Mean Frontal Detection Ranges For Suffolk Bat Species Using Anabat Detectors At Standard 'Field' Settings

English name	Mean frontal detection range (m)
Soprano pipistrelle	24
Brown long-eared bat	9
Natterer's bat	13
Noctule	47
Leisler's bat	38
Barbastelle	7
Lesser horseshoe bat	7

2.6 Bat Call Analysis

2.6.1 Selection of Data for Analysis

Because a very large amount of data is likely to be recorded during a full field season of static bat detector recording, the majority of which will represent the common pipistrelle species, it is not cost-efficient or necessary to check and label every pass of all species of bats. All recordings were checked for rarer species of potentially higher conservation significance by scanning sound files for these species. The species selected were: barbastelle, Nathusius' pipistrelle and Leisler's bat (hereafter referred to as Group 1).

For all other species of bats (Group 2), a sub-set of three nights of data from each deployment - those with the highest number of bat calls recorded - were analysed in detail. By choosing the

nights with the highest activity levels it is assumed that nights with optimal conditions for recording bat activity were also chosen. In this sense, the bias inherent to selecting data for analysis non-randomly in this way is similar to the bias when selecting nights with favourable conditions for carrying out other bat surveys. The only bias which is likely to result is that the activity rates for Group 1 species will be higher than if all the data within the relevant recording period were analysed (as for Group 2 species). As the data have been used to determine relative activity levels and not to provide a measure of abundance, this upward bias is unlikely to make any difference to the evaluation of the importance of bat populations at Sizewell.

2.6.2 Bat Call Identification

Recorded bat calls were analysed using Analook software to confirm the identity of the bats present. Where possible, the bat was identified to species level. For species of long-eared bats records were not identified to species level due to the overlapping call parameters of each species but were assumed to refer to brown long-eared bats. It is unlikely that grey long-eared bat *Plecotus austriacus* occurs in Suffolk, given the species' known distribution and rarity (Harris & Yalden, 2008). Species of the genus *Myotis* were grouped together as many of the species have overlapping call parameters, making species identification problematic (BCT, 2007).

For *Pipistrellus* species the following criteria, based on measurements of peak frequency, were used to classify calls:

Common pipistrelle	≥ 42 and < 49 kHz
Soprano pipistrelle	≥ 51 kHz
Nathusius' pipistrelle	< 39 kHz
Common pipistrelle / Soprano pipistrelle	≥ 49 and < 51 kHz
Common pipistrelle / Nathusius' pipistrelle	≥ 39 and < 42 kHz

In addition, the following categories were used for calls which could not be identified with confidence due to the overlap in call characteristics between species or species groups:

- *Myotis/Plecotus* sp.
- *Nyctalus* sp. (either Leisler's bat or noctule).
- *E. serotinus/N. leisleri* (either serotine or Leisler's bat)

Bat calls which could not be ascribed to any of these categories were not used in the analysis.

2.6.3 Calculation of Relative Activity

The Analook software enables analysis of the relative activity of different species of bats by counting the minimum number of bats recorded within discrete sound files. Once triggered by ultrasound, the Anabat records sound files with a duration of 15 seconds, which may contain a number of individual bat passes, or discrete groups of ultrasound 'pulses'. For the purposes of this analysis, the recording of one or more passes by a single species of bat within a 15 second sound file is counted as a single bat pass (B). More than one pass of the same species was counted within a sound file if multiple bats were recorded calling simultaneously. During analysis of sound files, it was possible to estimate the minimum number of bats recorded on

individual sound files but not whether consecutive sound files had recorded, for example, a number of individual bats passing as they commute to a feeding habitat or one bat calling repeatedly as it flies up and down a hedgerow. Therefore, relative abundance of bats cannot be estimated from this analysis, but the number of bat passes does reflect the relative importance of a feature/habitat to bats by assigning a level of bat activity that is associated with that feature, regardless of the type of activity. In this analysis, bat passes per hour (B/h) has been used as a measure of 'relative activity'.

2.6.4 Analysis by Sunset-sunrise Times

As part of the analysis of nocturnal patterns of behaviour for bats at Sizewell the data were split into discrete time periods relating to their proximity to sunset or sunrise. The time categories (time codes: TC) were as follows:

TC 0 = before sunset

TC 1 = 0-20 min after sunset

TC 2 = 20-40 min after sunset

TC 3 = 40-60 min after sunset

TC 4 = 60-80 min after sunset

TC 5 = 80-100 min after sunset

TC 6 = 100-120 min after sunset

TC 7 = Middle of night (varies across seasons)

TC 8 = 120-100 min before sunrise

TC 9 = 100-80 min before sunrise

TC 10 = 80-60 min before sunrise

TC 11 = 60-40 min before sunrise

TC 12 = 40-20 min before sunrise

TC 13 = 20-0 min before sunrise

For each of these categories B/h was calculated to allow a comparison between the activity level recorded in different time periods and TC7 was corrected to allow for variation in night length throughout the survey season.

2.7 Roost Surveys

2.7.1 Surveys of Upper Abbey Barn

Building Inspection

Two internal and external inspections were carried out on Upper Abbey Barn on 8 June and 20 July by experienced bat ecologists Matthew Hobbs (both dates), Vilas Anthwal (8 June only) and Iain Hysom (20 July only). A search of all external elevations and accessible internal areas

was undertaken for evidence of bats such as droppings, feeding remains, staining and scratch marks. In addition, any cobweb-free potential roost entry points were also recorded. Close focussing binoculars and torches were used to visually search the external elevations, with internal areas searched using torches as necessary.

Bats roost in a wide variety of places within buildings, with many species roosting in cracks and crevices, under lintels and within joints in timber beams where they are difficult to see. They may also be more obvious if, for example, roosting in large numbers or hanging within roof spaces. Bats often access buildings at key areas such as through gaps between external boarding or under roofing tiles. The absence of evidence such as droppings and other signs does not always indicate the absence of roosting bats as certain species of bat roost in areas that are inaccessible to surveyors. During the inspection survey, particular attention was focussed on finding evidence that might suggest the presence of roosting barbastelles, such as accumulations of droppings or roosting features that might be suitable for a maternity colony of this species.

Emergence/Re-entry Survey

A dusk emergence survey was also carried out at Upper Abbey Barn on 20 June with an additional dawn re-entry survey on 3 August. Three surveyors were used during each survey. The timings, weather conditions and surveyor details for each survey are given in Section 3.4.1. The emergence survey commenced approximately 15 minutes before sunset and continued until approximately two hours after sunset. The dawn survey commenced approximately 2 hours before sunrise and finished 15 minutes after sunrise. During both surveys, three surveyors were positioned on the south-west, south-east and north-east corners of the barn to cover all sides of the barn. However, greater attention was focused on the south, west and east elevations of the barn as most of the potential access points to the barn (for bats) were identified on these elevations.

Surveyors used two different bat detectors during each survey to supplement visual observations: a Batbox Duet detector for listening to bat calls from the combined heterodyne/frequency division output and an Anabat frequency division detector for recording calls for subsequent identification.

Static Bat Detector Survey

A bat detector was deployed inside the barn for 82 nights between May and September during the following periods: 11-22 May, 8-20 June, 4-17 July, 20 July–2 August, 23 August-5 September and 6-20 September to establish whether significant activity from bats, and particularly barbastelle, was recorded from within the barn. The detector was located centrally on the southern wall of the barn at 3m height in order to record bats echolocating within the barn.

Although numerous calls from pipistrelle bats were recorded, and it is known (from emergence/re-entry surveys) that small numbers of common and soprano pipistrelle roost in the barn during the active period, pipistrelle calls have not been analysed and presented in the results section. The focus of the survey was to establish the presence of roosting barbastelles within the barn and, if possible, assess the status of any roost. We also identified calls of other (non-pipistrelle) species that were using the barn during the survey period.

2.7.2 Inspection Surveys of other buildings within the Sizewell Estate

The owners of the other buildings on and adjacent to the areas currently likely to be affected by the proposed development were contacted and, where access was permitted, buildings that appeared to have some potential to contain bat roosts were subject to an external and internal inspection for bats or evidence of bats. The properties investigated initially (with OS grid references) were:

- Ash Wood Cottages (TM 46069 64987) (previously reported to contain a maternity roost of brown long-eared bats);
- Leiston Old Abbey (TM 45022 64049) (currently in use as a care home);
- Old Abbey Farm (TM 45038 64174) (a bungalow with associated farm outbuildings);
- Abbey Cottage (TM 44876 64408); and
- The Round House (TM 45416 65241).

Ash Wood Cottages are a pair of occupied semi-detached dwellings; access was obtained to the western half of the roof void of the cottages on 20 June 2011, when the interior was inspected for bats and evidence of bats such as droppings or urine staining. The buildings at Old Abbey Farm comprise an occupied bungalow and modern farm outbuildings. Access into the roof void of the bungalow was not permitted by the owners, but the exterior and the farm outbuildings were inspected for potential roost sites and evidence of bats on 20 June 2011. The inspections were carried out by Lynn Whitfield (NE scientific licence no. 20111599).

The owners of Leiston Old Abbey would not permit access to the premises for inspections, and no reply was received to communications sent to Abbey Cottage. The Round House proved to be a very modern building in good repair, with no obvious access points for bats, and confirmed by the owner to have no separate roof void.

2.7.3 Emergence Surveys during Radio-tracking

Barbastelle

Evening emergence surveys of all roost trees that had been used by breeding female or juvenile barbastelles in 2011 during the trapping and radio-tracking surveys were carried out. The last night of radio-tracking on 10 August was preceded by emergence surveys of 8 tree roosts, including three used by tagged bats immediately prior to the surveys. This was to allow an estimated minimum population count to be achieved for the site. The emergence surveys were co-ordinated to be undertaken simultaneously due to the highly mobile nature of barbastelle maternity roosts, which often move every 1-2 days (Greenaway, 2008; Greenaway & Hill, 2004).

The surveys involved a total of ten surveyors (one per tree with two surveyors on two tree roosts) with infra-red video cameras (with supplementary infra-red illumination) used to assist in the surveys of four of the trees. Bat detectors (Anabat, Batbox Duet, or Pettersson D240x detectors attached to digital recorders) were used by all surveyors.

An emergence survey was also carried out of R9 by BSG staff on 2 August 2011 due to the presence of three tagged bats in the tree at the time.

Natterer's Bat

Emergence surveys were undertaken at Leiston Abbey Ruins (roost RA) on 31 July and 10 August with a dawn re-entry survey undertaken on 10 August. Both roost RF in The Grove and roost RE in Sandpytle Plantation were subject to emergence surveys, with Sony camcorders used to assist the surveyors, on 8 and 9 August respectively.

Brown Long-eared Bat

No emergence surveys were carried out of Roost RC due to the other priorities of surveyors.

2.7.4 Bat Box Surveys

A number of bat boxes have been attached to Corsican pine *Pinus nigra* ssp. *laricio* trees in plantation woodland within Kenton Hills. These boxes are usually checked annually by the Suffolk Wildlife Trust in September (Alan Miller, pers. comm.) when there is limited risk of disturbance to any breeding colonies of bats. A single bat box check was carried out on 9 September 2011 following the discovery of a maternity roost of Natterer's bat in one of the boxes during radio-tracking of a breeding female.

2.8 Evaluation methods

In order to evaluate the importance of ecological features identified from field surveys, a set of standard measures are outlined in guidance produced by the Institute of Ecology and Environmental Management (2006). For each site, habitat and species/assemblage, a summary grade is determined based on the levels of value recommended in the guidance. This places the importance of each feature in a geographical context, using the following hierarchy:

- International;
- UK;
- National (i.e. England, Northern Ireland, Scotland or Wales);
- County (or Metropolitan - e.g. in London);
- District (or Unitary Authority, City or Borough);
- Local (or Parish); or
- Site - within immediate zone of influence only (the development site and surrounds).

Formal criteria have been used, where possible, to assess the conservation importance of each feature within a geographical context. For example, the Guidelines for the Selection of Biological SSSIs (Nature Conservancy Council, 1989) can be used as a basis for the assessment of features at a national level. Similarly, published guidelines for the selection of SINC (Sites of importance for nature conservation) can be used as a basis for assessing features of county level importance.

The significance of bat populations has been determined using the principles described in the IEEM *Guidelines for Ecological Impact Assessment in the United Kingdom* (IEEM, 2006).

Particular consideration has been given to distribution and rarity at different geographical levels. In this case, reference has been made to:

- UK BAP;
- Suffolk Local BAP;
- *Distribution atlas of bats in Britain and Ireland 1980-1999* (Richardson, 2000); and
- The state of the UK's bats: National Bat Monitoring Programme Population Trends (Bat Conservation Trust, 2010).

2.9 Personnel

The bat survey work in 2011 was co-ordinated and led by Matthew Hobbs (MH) of BSG. The trapping and radio-tracking study was led by Helen Lucking (HL) of Corylus Ecology (Natural England licence number 20112162). A further six surveyors were used for this element of the survey work¹¹.

Walked transect and static detector survey work during 2011 was carried out by a total of six ecologists. These surveys were all led by either Matthew Hobbs or Vilas Anthwal (VA; licence number 20110076) with another four surveyors assisting¹². For emergence surveys, ten surveyors were used¹³. The bat box survey was carried out by Vilas Anthwal and Matthew Hobbs.

The inspections at Ash Cottages and Old Abbey Farm were carried out by Lynn Whitfield (AMEC; NE scientific licence no. 20111599).

2.10 Survey Limitations

2.10.1 Trapping and Radio-tracking

Weather

During the radio-tracking session, the weather was generally good with dry, calm conditions. The coldest night was during the first night of trapping when the temperature dropped to 7.5°C and the temperatures were generally low for August with temperatures during the night averaging 14.4°C and the average minimum night time temperature 13.1°C. Although the

¹¹ Alastair Wrigley (AW; licence number 20111813), Paul Spencer (PS; license number 20112421, Heather White (HW; all Corylus Ecology), Geoff Billington (GB; Greena Ecology; licence number 20110979), Alison Johnson (AJ; freelance; licence number 20111948), Narawan Williams (NW; freelance).

¹² Laura Jennings (LJ) and Stephanie Boocock (SB; Licence number 20113031) of BSG, Iain Hysom (IH; freelance; License number 20110086 and Paul Spencer (Corylus Ecology).

¹³ Laura Jennings, Vilas Anthwal, Helen Evriviades (HE; licence no. 20103809) (all BSG), Alastair Wrigley, Helen Lucking, Paul Spencer, Heather White (all Corylus Ecology), Geoff Billington (Greena Ecology), Alison Johnson and Narawan Williams (both freelance).

weather overall is not considered to be a constraint to the survey, weather conditions which differ from the overall, dry, calm and mild conditions are detailed below.

On 3 August 2011 at sunset the conditions were good and dry, however, light rain occurred at 21:45 becoming heavier until 22:45 when it stopped. It remained dry for the rest of the night. During the daytime on 4 August there was very heavy rainfall all through the day but it was dry by the evening.

On the night of 8 August weather conditions were initially good but towards the end of the night the wind strengthened with rain from 04:30.

Logistical Constraints

As was found during 2010, the landscape of the area made joint bearings difficult to take in places. In addition, some areas could not be used for taking bearings due to electrical interference such as near Ash Wood where there was electric fencing. Much of the area is flat and there were few good vantage points from which to take bearings over the wider landscape. Although there is slightly higher ground in Nursery Covert and Goose Hill, these areas are not particularly elevated and have undulating ground. As a result the signal from tagged bats would rapidly appear and disappear as they moved under and over ridges in the woodland and surveyors frequently had to move location to be able to take bearings. Care was taken not to cause a nuisance to local residents late at night and in some instances this restricted vantage points for taking bearings. Care also had to be taken to ensure that the surveyors were positioned away from overhead cables and from cars to avoid disturbance to the compasses and radio-signals.

Home Range Calculations

Gathering regular accurate triangulated fixes for foraging bats is difficult, because bats forage in flight and at speed, continually twisting and turning, causing fluctuations in transmitter pulse amplitude which can impede interpretation of distance and direction (Mackie & Racey, 2007). Barbastelle is a wide-ranging, fast-flying species which switches roosts frequently, making it a particularly challenging species to track. As a result of these survey constraints, some bats were followed less closely than others and the number of successful triangulation points or 'fixes' (which are determined from intersecting bearings taken simultaneously) varied significantly between bats.

Home range analyses are also based on the time between observations. Increasing the number of samples within a shorter period is unlikely to improve the accuracy of analysis: there is a trade-off between the sampling interval and the sample size. However, in addition to home range information, data on areas of foraging, the way the bats use the Sizewell Estate and potentially the use of particular features within the landscape were of particular importance in terms of providing information for the EcIA. If joint bearings were taken only every 20 minutes, less of this descriptive information would be obtained.

The aim of obtaining as many triangulation points as possible means that some of the tracking data may include auto-correlated fixes (Millsaugh & Marzluff, 2001). Autocorrelation can result (1) when the animal has too little time to move away from the first observation point, (2) when the animal does not move between observations, or (3) when the animal periodically returns to a previously used portion of its range (Hansteen *et al.*, 1997). Because it was important to acquire information within the survey area when the opportunity presented itself, the method followed did not include any pre-determined time interval between successive observations (except during close tracking, see Section 2.2.3), which is sometimes used to

reduce the possibility of autocorrelated data. Overall, a high number of joint bearings were taken for most individual bats and the accuracy of the large majority of the bearings taken is considered to be satisfactory for the purposes of the survey. The difficulties described here are not considered a significant constraint to the survey.

Loss of Tags

Another constraint was the early loss of tags or bats. A number of bats lost or groomed off tags and there was significant variation in the length of time each tag remained attached for. Full details can be found in Section 3.1.2. Despite these problems, a representative dataset was collected for most of the bats that were tagged and radio-tracked and this is not considered a significant constraint to achieving the aims of the survey.

2.10.2 Walked Transects

Although one survey had to be changed from dusk to dawn due to poor weather, all transect surveys were carried out in good weather conditions and no constraints were recorded to the walked transect surveys.

2.10.3 Static Bat Detector Survey

Some of the Anabat recorders deployed for long-term monitoring failed to record successfully but this happened during only seven out of 66 deployments. Anabats were successfully re-deployed for four of the seven deployments but data were not collected successfully for P1 1c, P2 3a or P3 1d. Despite the small loss of data it is considered that sufficient data were collected to adequately inform the assessment.

2.10.4 Roost Surveys

No significant limitations to the emergence surveys during radio-tracking or of Upper Abbey Barn were encountered.

During the inspection of Upper Abbey Barn it was not possible to inspect the higher parts of the Barn above the reach of ladders. However, these were inspected with binoculars and the focus of the survey was to try and find signs that may indicate the presence of barbastelle bats, such as droppings on the floor of the barn.

During the bat box survey on 9 September, several bat boxes were found without lids where they had blown off in the wind. However, the majority of boxes were unaffected and could be inspected.

3. Results

3.1 Trapping and Radio-tracking Surveys

3.1.1 Trapping Results

A total of 148 bats from at least seven species were caught during five nights of trapping (30 July-3 August). Full details of all bats caught are provided in **Table C1** with a summary of the species caught provided in **Table 3.1**. Vantage points for taking bearings are shown in **Figure C1**. The trapping and roost locations are shown in **Figure C2**. **Figure C3** shows photographs of the roosts. **Table 3.2** provides a summary of the barbastelle bats caught and all bats tagged and radio-tracked.

The tree and building roosts used by tracked barbastelles (from 2010 and 2011, numbered consecutively) are detailed in **Table C2**. The trapping location at which each bat was caught and which roost each bat used during each day are shown in **Table C3**.

Plans for each barbastelle tracked with triangulation points, extent of ranges and the MCP, neighbourhood linkage (clusters) and kernels are shown on **Figures C4-C19**, with those for Natterer's bats shown on **Figures C20-C23** and those for brown long-eared bat on **Figure C24**.

Table 3.1 Summary of all Bats Trapped¹⁴

Species	Male	Female		Juv male	Juv female	Sex unknown	Total	Percentage
		B	NB					
Barbastelle	1	7	2	6	2		18	12.2
Common pipistrelle	13	5	3	1	1		23	15.5
Soprano pipistrelle	26	20	2	2	1		51	34.5
<i>Pipistrellus</i> sp.						1	1	0.7
Nathusius' pipistrelle ¹⁵				1			1	0.7
Natterer's bat	10	8	5	2	1		26	17.6
Brown long-eared bat	11	7	1				19	12.8
Serotine	4	4	1				9	6.1
Totals	65	51	14	12	5	1	148	

¹⁴ B = has bred this year; NB = has not bred this year.

¹⁵The identity of this bat could not be confirmed as either common pipistrelle or Nathusius' pipistrelle.



**Table 3.2 Summary Information on all Bats Tagged¹⁶**

Bat No.	Species	Ring No.	Sex	Breeding status	Forearm length (mm)	Weight (g)	Comments	Tag weight (g)	% of body weight
1	Natterer's bat	-	Female	NB	41.1	7.8	-	0.47	6.0
2	Natterer's bat	-	Female	PL	39.5	8.7	-	0.47	5.4
3	Barbastelle	T8852	Female	NB	39.6	8.7	Medium ET, fused joints, patchy wings	0.47	5.4
4	BLE	-	Female	PL	39.7	9.1	-	0.47	5.2
5	Barbastelle	T8854	Male	Juvenile	38.2	7.1	No ET	0.35	4.9
6	Barbastelle	T8853	Female	PL	38.9	10.4	-	0.47	4.5
7	Barbastelle	T8855	Male	NB	39.8	9.2	Medium ET	0.47	5.1
8	Barbastelle	T8856	Female	PL	40.4	9.9	Small ET	0.47	4.7
9	Barbastelle	T8859	Female	PL	37.9	11.3	Medium ET	0.47	4.2
10	Barbastelle	-	Male	Juvenile	38.5	5.9	Medium ET, not ringed due to low weight	0.28	4.7
11	Barbastelle	T8860	Female	PL	39.3	9.4	Very small ET	0.47	5.0
12	Barbastelle	T8864	Male	Juvenile	36.9	6.6	Medium ET	0.35	5.3
13	Barbastelle	T8861	Female	PL	39.5	9.3	Large ET	0.47	5.1
14	Barbastelle	T8865	Male	Juvenile	36.5	6.9	Large ET	0.35	5.1
15	Barbastelle	T8866	Male	Juvenile	37.2	7.1	Very small ET	0.35	4.9
16	Barbastelle	T8869	Female	NB	38.8	7.7	Large ET	0.47	6.1
17	Barbastelle	T8862	Female	PL	39.7	8.1	Medium ET	0.47	5.8

¹⁶ B = has bred this year; NB = hasn't bred this year; PL = post-lactating; BLE = brown long-eared bat; ET = ear tags; some barbastelles have circles of skin on the outside of their ears which can be used to distinguish between individuals.



Bat No.	Species	Ring No.	Sex	Breeding status	Forearm length (mm)	Weight (g)	Comments	Tag weight (g)	% of body weight
18	Barbastelle	T8867	Female	Juvenile	38	7.7	Medium ET	0.35	4.5
-	Barbastelle	-	Female	Juvenile	32	4.9	Not tracked or ringed due to low weight.		
19	Barbastelle	T8868	Male	Juvenile	37.8	7.1	Long and thin ET	0.35	4.9
20	Barbastelle	T8863	Female	PL	39.4	7.9	Large ET	0.47	5.9
21	Natterer's bat	-	Female	PL	40.2	9.4	-	0.47	5.0
22	Natterer's bat	-	Female	NB	40.4	8.6	-	0.47	5.5

3.1.2 Movements of Tagged Barbastelles

A summary of the movements of tagged bats is provided below and full accounts are provided in **Appendix C**.

Bat 3

This bat, a non-breeding female, was caught at Turf Pits on 31 July. The tag began malfunctioning as soon as the bat took flight. After being released it appeared to move to Nursery Covert and was static for almost an hour. Eight joint bearings were then taken for this bat confirming it foraging as widely as Round Covert (to the south of Sandy Lane), in the area of Grimseys and the adjacent belts, in Kenton Hills and Hilltop Covert. It was recaptured from tree roost R14 on 2 August and the aerial cut off as the tag had malfunctioned and stopped working.

Bat 5

This bat, a juvenile male, was caught at 02:20 on the night of 31 July at Goose Hill (T8). Twenty-one joint bearings were taken with 15 single point estimates. The bat foraged widely in the area of Black Walks, Goose Hill and The Grove, the field network around Ash Wood and Kenton Hills and Sizewell Belts in the south. During 1-6 August the bat roosted in tree roosts R14, R9, R17, R19 and R21. A static signal from R21 on 6 August indicated that the tag had been dislodged.

Bat 6

This bat, a post-lactating female, was caught at 04:20 on the night of 31 July at Goose Hill (T8). Thirty seven joint bearings were taken over four nights with four single bearing estimates plotted from monitoring and close tracking. The bat was recorded foraging as widely as the south-eastern corner of Goose Hill, the fields and dunes adjacent to the sea and south over the sea wall bund by Sandlings Walk. During 1-6 August it used tree roosts R14, R9 and R17. From 7 August the signal was static in roost R17 and the tag was believed to have been dislodged.

Bat 7

This bat, a non-breeding male, was caught at 04:20 on the night of 31 July at Goose Hill (T8). A total of 24 joint bearings were achieved with a further 15 single point estimates. The bat was found roosting at R16 on 1 August on the south side of Kenton Hills. From 6-11 August it was confirmed roosting at a barn at Hill Farm west of the Sizewell Estate (R22). The bat was recorded foraging widely over the southern half of the Sizewell Estate, in Kenton Hills and Sizewell Belts, around Sandy Lane and Leiston Common and to the west around Theberton and Eastbridge.

Bat 8

This bat, a post-lactating female, was caught at 04:20 on the night of 31 July at Goose Hill (T8). From 1-5 August the bat was confirmed using tree roosts R15, R14, R9, R13 and R19. On 6 August the tag was found hanging in bracken near roost R21, presumably having been groomed from the bat. A total of 12 joint bearings and 12 single point estimates were recorded before the tag came off. The bat foraged as widely as Kenton Hills/Nursery Covert, Ash Wood and north into Minsmere.

After being caught and tagged late in the night when the traps and mist nets were being taken down, the bat roosted (R15) near to where it was released in Nursery Covert. This was the only pine *Pinus* sp. tree used by roosting barbastelles in 2010 and 2011 and it was considered to be an atypical and temporary roost.

Bat 9

This bat, a post-lactating female, was caught along Abbey Lane (T3) on the night of 1 August at 03:40. A total of thirty-four joint bearings and four single point estimates were recorded before the tag came off. It foraged widely over the southern half of the Sizewell Estate, east to the coastal strip near Goose Hill, south to Sizewell Belts, west to Leiston Old Abbey Woods and north to Black Walks and Minsmere Cut. It used roosts R9 and R17 from 2-5 August. On 6 August a static signal was recorded from an arable field south-west of the Sizewell Estate where the tag had been dislodged from the bat.

Bat 10

This bat, a juvenile male, was caught emerging from tree roost R14 on 2 August. It was ringed, tagged and released on the south side of Goose Hill. After release it remained static in trees in Sizewell Belts. It was recorded flying in Kenton Hills at 03:24 and then foraging south of Sandlings Walk, near the sea wall bund and in Goose Hill from 03:42 to 03:59. It was then tracked in a southerly direction around the eastern side of Goose Hill and was recaptured in a mist net at 04:10 on the southern side of Goose Hill. Given the late recapture, it was considered that the best option was to release it at Ash Wood. The bat flew away into Ash Wood and was later confirmed in tree roost R9.

It was noted during night tracking from 3 to 5 August that bat 10 had not been recorded flying since its recapture and subsequent release at Ash Wood on the morning of 3 August. After the grounding and death of bat 15 (see below) there was concern that bat 10 may not be foraging. During 3-5 August there was also an apparent switch and division of the colony to using a variety of tree roosts away from Ash Wood, including tree roosts R17 and R20 by Lower Abbey Farm, R19 on the south side of Kenton Hills and R21 on the north side of Kenton Hills. On 6 August tree roost R9 was observed from sunset using the radio-tracking equipment and an infra-red camcorder. The bat appeared shortly after sunset from behind loose bark where it rested on an exposed section of the tree. The bat made no attempt to fly or call and appeared very lethargic. It was observed for several hours and no other bats were recorded visiting the roost. As the bat could be reached safely without disturbing the loose bark, the decision was made to retrieve the bat and to give it food and water in the hope of being able to revive and release it. Its condition was assessed as weak, although the ring was in a normal position without causing any abrasions and the transmitter was also in a normal position. The bat took water and mealworms regularly and goat's milk was also used to supplement its diet. It was intended to release the bat on the evening of 8 August by returning it to roost R9 shortly before sunset. However, the forecast on the afternoon of 8 August was for thunderstorms and the decision was taken to attempt to release it the following morning when other bats had returned to the roost, but it died on the morning of 9 August.

Bat 11

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. Despite issues with the tag frequency drifting, ten joint bearings and 23 single point estimates were recorded before the tag came off. It was recorded foraging quite widely into Goose Hill, Kenton Hills, in the Black Walks area and around Leiston Old Abbey Woods. It was confirmed using tree roosts

R19 on 4 August, R21 on 5-6 August. From 7 August the signal was recorded as static from R21 and the tag was thought to be dislodged.

Bat 12

This bat, a juvenile male, was caught from tree roost R9 on 3 August. As with bat 11 the tag frequency appeared to drift when the bat was active making it difficult to pick up and only a single joint bearing and seven single point estimates were taken. The bat was recorded foraging in the Black Walks area and Lower Abbey Woods. It was confirmed using tree roost R9 on 4 August, then R19 on 5 August, then R17 on 6 August. From 7 August the signal was recorded as static from R17 and the tag was believed to have become dislodged.

Bat 13

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 112 joint bearings were achieved over 8 nights of tracking. Although no further single point estimates were plotted, the single point data were included in the text below. The bat was found roosting at R13, R19, R21, R17 and also R21 (as a night roost). The bat was recorded foraging widely over Goose Hill into Kenton Hills, Leiston Old Abbey woodland, Ash Wood, Black Walks and to the north and west of Eastbridge.

Bat 14

This bat, a juvenile male, was caught from tree roost R9 on 3 August. A total of 55 joint bearings were achieved. Although no further single point estimates were plotted, the single point data were included in the text below. After capture it remained in Ash Wood for the majority of the night but it moved north and used roost R17 in the Lower Abbey area on 4 August. On the night of 4 August few joint bearings were taken but surveyors positioned monitoring the Ash Wood area recorded the bat in Ash Wood from 22:28 to 23:00. It was recorded back at Lower Abbey from 23:00 to 00:06 where for some of this time it was considered static and most likely back in roost R17. On 5 August during the daytime search it was found using tree roost R19.

Bat 15

This bat, a juvenile male, was caught from tree roost R9 on 3 August. It was recorded flying in the area of Ash Wood at 02:51 and again at 04:02. It was last recorded at 04:50 as static in the north-east corner of Ash Wood. The bat was recorded in Ash Wood on the day of 4 August but during the night-time tracking of 4 August, the bat was not recorded in Ash Wood or other likely roost areas. At 05:07 Ash Wood was checked for a final time as was Lower Abbey Wood (R22) and Lower Abbey Farm (R17 and R20) and bat 15 was not found in these locations. On the morning of 5 August the bat was found grounded in long grass by brambles on the edge of the arable field beside the north-east corner of Ash Wood. It was in a weak condition and taken into care before being given water and mealworms but unfortunately died later that same day. It is possible that this bat had returned late back towards Ash Wood on the morning of 5 August but had failed to return to its roost and had become grounded. Wet conditions with heavy downpours persisted through the whole of the day of 4 August and it is uncertain whether this contributed to its death.

Bat 16

This bat, a non-breeding female, was caught from tree roost R9 on 3 August. A total of 50 joint bearings and five single point estimates were recorded. The single point data have been analysed and the information from this added into the text below. The bat was recorded foraging widely through Goose Hill, and the arable fields between Goose Hill and Ash Wood, in and around The Grove north to Dovehill Plantation and west towards the Round House and Eastbridge. This bat was also found roosting in trees R17, R19 and R21.

Bat 17

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 11 joint bearings were achieved with a further 16 single point estimates before the tag came off. The bat was recorded foraging widely over the belts south of Goose Hill, Leiston Old Abbey Woods, west to Greenhouse Plantation and north to Ash Wood. This bat was also found roosting in trees R17, R20, and R21. From 7 August the signal remained static in R21 suggesting that the tag had become dislodged.

Bat 18

This bat, a juvenile female bat, was caught from tree roost R9 on 3 August. It used tree roost R17 during 4-11 August. A total of 75 joint bearings and five single point estimates were recorded. The bat was recorded widely between the Black Walks area using the strong line of pine trees leading south to Ash Wood, the south side of Sizewell Belts, Kenton Hills, Sandy Lane and Reckham Pits Wood.

Bat 19

This bat, a juvenile male, was caught from tree roost R9 on 3 August. A total of 16 joint bearings and 5 single point estimates were recorded before the tag came off. The bat used tree roosts R13, R19 and R21 from 4-6 August. After that point the signal was confirmed as static from R21 and the tag was believed to have been dislodged. The bat was recorded foraging around Ash Wood, Lower Abbey Woods and Sandpytle Plantation.

Bat 20

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 17 joint bearings and 10 single point estimates were recorded. The bat used roosts R18 and R17. From 7 August the signal remained static in R17 suggesting that the tag had become dislodged. The bat was recorded foraging in the Sizewell Belts area, Ash Wood and Kenton Hills.

3.1.3 Movements of other Species of Tagged Bats**Bat 1 – Natterer's Bat**

This bat, a post lactating female, was caught at 22:25 on 31 July at Turf Pits (T2). A total of 17 joint bearings were achieved with a further 13 single point estimates before the tag failed. The bat was recorded roosting within Leiston Abbey ruins between 31 July and 7 August, after which point the tag battery expired.

Bat 2 - Natterer's Bat

This bat, a post lactating female, was caught at 23.45 on 30 July in a mist net at Fiscal Policy (T1). Twelve joint bearings and six single point estimates were recorded before the tag came

off the bat. It was recorded foraging in the Fiscal Policy area as well as around the sewage works and adjacent fields/ditch network to the south and west of Lover's Lane.

Bat 4 – Brown Long-eared Bat

This bat, a post-lactating female, was caught at the south-west corner of Goose Hill (T2) on 31 July at 01:45. The bat used an unknown roost site in Rookyard Wood south of Sandy Lane and then used roost RC in a house south of Sizewell for the rest of the tracking period. The bat was recorded foraging in the following areas: Goose Hill, Kenton Hills/Nursery Covert, Broom Covert, Reckham Pitts Wood, the northern Sizewell Belts and Grimseys.

Bat 21 - Natterer's Bat

Bat 21, a breeding female, was caught at the southern end of The Grove (T4) at 02:15 on 4 August. Thirty-five joint bearings were achieved. In comparison with the barbastelle bats, the area the bat was recorded in was much more restricted. The principal areas for foraging were around Goose Hill and The Grove and the open areas near Walk Barn.

Bat 22 - Natterer's Bat

Bat 22, a non-breeding female, was caught at The Grove (T4) at 03:15 on 4 August. A total of sixteen joint bearings and eight single point estimates were recorded. During the day the bat roosted in a bat box on a tree in Kenton Hills (RD). It was recorded foraging principally in the Goose Hill and Walk Barns area.

3.1.4 Roost Characteristics

Summary of Barbastelle Roosts

During the 2011 radio-tracking survey tagged barbastelle bats used 10 different tree roosts during the day, two of which had been also been used in 2010 (R9 and R13). Taking account of those tree roosts identified in 2010, there are now 21 trees known to have been used as roosts and two buildings, both used by single adult male barbastelles, with one in 2010 and another in 2011 also known to be used by barbastelle.

The roosts identified in the 2011 season were found in several areas. Three of these areas had not been used in 2010: the southern edge of Kenton Hills/Leiston Carr, the copse at Plantation Cottages and the woodland strip near Leiston Old Abbey. Of these new roosts, more than one breeding female and/or juvenile bat was recorded in six of them as follows:

- One in Ash Wood (R14) was used by four bats, two breeding females and two juvenile males, and was occupied by tagged bats on at least two days.
- One on the southern edge of Kenton Hills/Leiston Carr area (R18) was used by two breeding female bats on one day.
- Two in a woodland copse at Plantation Cottages west of Lower Abbey. R17 was used by three juvenile males, one juvenile female, five breeding females and one non-breeding female (10 bats) and was occupied by tagged bats on at least two days. R19 was used by four juvenile males, two breeding females and one non-breeding females (seven bats) and was occupied by tagged bats on at least nine days.

- One (R20) in the line of oak trees orientated east-west along the northern edge of Nursery Covert and Kenton Hills, where three tree roosts (R1, R2 and R11) had been found during 2010. This roost was used by two breeding females and was occupied by tagged bats on at least two days.
- One in the strip of woodland just north of Leiston Old Abbey (R21) was used by seven tagged bats, three juvenile males, three breeding females and one non-breeding female, and was occupied by tagged bats on at least six days.

The two tree roosts found in 2010 that were used again in 2011 are described below:

- Two in Ash Wood (R9 and R13). R9 was used by 15 of the 19 tagged barbastelles including six juvenile males, a juvenile female, seven breeding females and two non-breeding females, and was occupied by tagged bats on at least four days. R13 was used by one juvenile male and two breeding females, and was occupied by tagged bats on at least one day.

Another four roosts were used either by single bats for single nights or as night roosts:

- One in pine plantation (R15) in the north-eastern corner of Nursery Covert was used by a breeding female for one day and may have been a temporary roost.
- One on the southern edge of Kenton Hills/Leiston Carr area (R16) was used for one day by the only tagged adult male barbastelle.
- A bat was considered to be using a night roost in the Greenhouse Plantation area where a single daytime tree roost was found in 2010 and another bat used a night roost to the north in the Minsmere Cut area on at least two nights, although the exact locations of these roosts could not be determined.

In contrast to 2010, no barbastelles were recorded roosting in The Grove, where three tree roosts had been found during 2010, in Grimseys, in Greenhouse Plantation or in Hangman's New Wood (within the RSPB land at Minsmere), where single daytime roosts were found in 2010.

Barbastelle Roost Features

Of the roosts located in 2011 five were behind loose/lifted or flaking bark (R9, R13, R14, R17 and R18). The exact location in a sixth roost (R19) could not be determined due in part to the size of the tree, a mature oak, and the number of suitable features which included raised bark in the crown and a horizontal split in a limb. Two more roosts were in vertical splits in the main stems of large trees (R13 and R21). The other roosts (R15 and R16) were used for one day by single bats, R15 by a breeding female immediately after it had been caught and the latter by the only adult male bat.

Five of the eight new barbastelle roost trees identified in the 2011 season were in oak trees. The other three were a pine tree (R15), a large crack willow *Salix fragilis* (R16) and a very large mature sweet chestnut *Castanea sativa* with extensive dead wood and plates of bark over the heart wood (R17). R17 was the only tree used by breeding female and juvenile bats that was not an oak tree.

With regard to the height of the roosting positions, only one was between 3m and 6m above ground level (agl), five were 6-10m agl (see **Table 3.3**) and four were higher at up to 13m agl.

The lowest roost was R18, located in the elbow of a bent-over limb at 4m agl. It was in a cluttered area with abundant dead wood and dense rhododendron *Rhododendron ponticum*.

Table 3.3 Distance of Known Roost Trees used in 2011 from the Nearest Woodland Edge

Tree roost no.	Distance from nearest edge (m)	Height of roost area (m agl*)
R9	13	6-8
R13	20	8
R14	35	12
R15	39	8-15
R16	5 – used by adult male only	6-10
R17	11	8-12
R18	11	4
R19	0	8
R20	1	6
R21	0	9-13

* agl - above ground level

Movement between Roosts

Barbastelles are known to move roosts regularly (Russo *et al.*, 2004). Within the current study area, Ash Wood and the woodland adjacent to Plantation Cottages are relatively isolated, whereas the woodland at Leiston Old Abbey links directly to Fiscal Policy and into Kenton Hills. The Grove, used by radio-tracked barbastelle bats in 2010 but not in 2011, is a thin strip of woodland connected to coniferous plantation on its southern side.

The distances between tree roosts used by breeding female bats and juvenile bats are given in **Table 3.4**. The bats at Sizewell were tracked in the post-lactation period, and the smallest distance between switched roosts was 105m (between R17 and R19 near Plantation Cottages) and the largest distance recorded was 1741m, between R18 at the southern end of Kenton Hills and R17 near Plantation Cottages. The average distance between switched roosts was 841m (1203m in 2010). The average distance between switched roosts by juvenile bats was 690m. This data suggests that the population in Sizewell switch roosts on a regular basis and travel significant distances between roosts.

Table 3.4 Distances of Barbastelle Roost Switches in 2011

Roosts	Distance (m)	Age, sex and breeding status of bats
R14 – R9	264	Juveniles and breeding females
R9 – R17	664	Juveniles and breeding females
R17 – R21	1688	Juveniles and breeding females

Roosts	Distance (m)	Age, sex and breeding status of bats
R15 – R14	918	Non-breeding and breeding females
R9 – R13	287	Juveniles and breeding females
R19 –R21	1730	Juveniles and breeding females
R9 – R18	1137	Adult females
R18 – R20	467	Adult females
R9 – R19	615	Juveniles
R19 - R17	105	Juveniles and non-breeding females
R17 – R20	1581	Adult females
R20 – R21	562	Adult females
R18 - R17	1741	Adult females
R14 – R9	264	Juveniles and breeding females
R13 – R19	594	Juveniles and breeding females

Natterer's Bat Roosts

The first two breeding female Natterer's bats (bats 1 and 2) to be caught and tagged at Fiscal Policy on the night of 30 July were tracked back to Leiston Abbey Ruins (roost RA¹⁷) and remained roosting there until their tags failed (for eight and two nights respectively). The bats appeared to enter/exit the ruins at the western end through numerous cracks and crevices in the stonework and they were tracked for a considerable distance moving inside through the thick stone walls from their roosting positions to their access points.

The second pair of female Natterer's bats (bats 21 and 22) were caught and tagged at The Grove and were recorded roosting in different locations. Bat 21, a breeding female, moved between two tree roosts, in The Grove (RF) and Sandpytle Plantation (RE). The former is an alder *Alnus glutinosa* tree with a wound at 5m and the latter is a small oak with three woodpecker holes. Bat 22, a non-breeding female, used a single roost for all eight days: a wooden bat box at the southern end of Kenton Hills (RD).

Brown Long-Eared Bat Roosts

The only brown long-eared bat (bat 4) to be tagged was a breeding female. On the day following its capture, the exact roost location could not be found but was in woodland at Rookyard Wood. The bat spent the next seven days (until the tag was lost) at RC, which is in a small residential dwelling located some 200m west of Sizewell beach, adjacent to the Cliff House Caravan Park. The building is square in plan with a pyramidal roof structure and a central chimney. The roof is covered with large slate tiles with clay bonnet tiles lying over a modern, untrussed timber frame. No roof lining is present. Some of the mortar beneath the clay bonnet tiles is missing, providing potential access points for bats. Lead flashing is present around the base of the chimney and this is lifted in places providing potential access for bats. Gaps which may provide

¹⁷ Roosts used by radio-tracked bats of species other than barbastelle are numbered alphabetically in the chronological order of when each roost was first located.

access for bats were noted between the soffit and the brick wall on the eastern elevation of the building.

Internally the roof void is small, measuring approximately 8m by 8m with an apex height of approximately 1.5m. A dead bat was found inside the roof void, and although the age of the specimen made it hard to determine the species it was believed to be a juvenile brown long-eared bat. Three distinct piles of long-eared bat droppings were recorded within the roof void, each containing between 100 and 300 droppings with a mix of old and new droppings present. Two of the piles of droppings are located beneath perch sites where staining was noted on the roof timbers. A gap between the roof timbers and the roof lining created by rotten timber was noted towards the centre of the void. Some staining was noted in this location.

3.1.5 Foraging Areas and Home Ranges of Barbastelle Bats

Bats were recorded using a wide variety of habitats during the radio-tracking surveys. The areas used are summarised in **Figures C4-C19**, which illustrate triangulation points, extent of ranges and the MCP, neighbourhood linkage (clusters) and kernels for each bat.

Although the radio-tracking undertaken followed the bats for only a relatively short period of time, the data collected shows some strong patterns to barbastelle behaviour in the site, particularly when it is considered together with the data from the 2010 surveys. A summary of the key habitats used in 2011 is given below:

- Ash Wood/Black Walks – all adult females and all juveniles;
- Goose Hill– all adult females, and two juveniles;
- Upper Abbey track and Leiston Old Abbey woodland – all adult females and seven juveniles;
- The Grove and fields east of the Grove – two adult females and one juvenile;
- Kenton Hills and Nursery Covert – four adult females, three juveniles and one adult male;
- Arable fields north of Kenton Hills – four adult females and four juveniles;
- Sizewell Belts (north-eastern area) – six adult females, one juvenile and one adult male;
- Sizewell Belts (south of Grimseys and Leiston Carr) – two adult females, three juveniles and one adult male;
- Sandy Lane and area south of Sandy Lane – two adult females and one juvenile ;
- Greenhouse plantation/pasture west of Abbey Lane – two adult females;
- Sandpytle Plantation/north of Lower Abbey – one adult female;
- Eastbridge and Minsmere Cut – two adult females and one adult male; and
- Near Lover’s Lane/sewage works– one adult female, one juvenile and one adult male.

Home Range Analysis

A 95% MCP, cluster and kernel analysis was carried out for each tagged bat. A summary of the MCP sizes is provided in **Table C4**. **Figures C25-27** and **Figures C28-30** show the results of MCP, clusters and kernel analysis for breeding female and juvenile barbastelles respectively. The results of home range analysis are set out below. A summary of the number of fixes (both joint bearings and single point estimates) achieved for each bat are included in **Table 3.5** below.

Number of Fixes

Good locational data (both joint bearings and single points) was achieved for most bats. A total of 50-100 fixes was achieved for three bats, a non-breeding female, a juvenile male and a juvenile female and more than 100 fixes was achieved for the breeding female bat. However, more than 30 fixes were achieved for 9 of 15 barbastelles that were radio-tracked¹⁸ and this data is considered to represent the home ranges of most bats tracked during the survey.

Table 3.5 Summary of Number of 'Fixes' Achieved for Each Bat

Bat number	Species	Sex	Status	Number of 'fixes' achieved.		
				Joint bearings	Single point	Total
1	Natterer's bat	Female	NB	17	13	30
2	Natterer's bat	Female	PL	12	6	18
3	Barbastelle	Female	NB	8	0	8
4	BLE	Female	PL	22	9	31
5	Barbastelle	Male	Juvenile	21	15	36
6	Barbastelle	Female	PL	37	4	41
7	Barbastelle	Male	NB	24	15	39
8	Barbastelle	Female	PL	12	12	24
9	Barbastelle	Female	PL	34	4	38
10	Barbastelle	Male	Juvenile	NA	NA	0
11	Barbastelle	Female	PL	10	23	33
12	Barbastelle	Male	Juvenile	1	7	8
13	Barbastelle	Female	PL	112	0	112
14	Barbastelle	Male	Juvenile	55	0	55
15	Barbastelle	Male	Juvenile	NA	NA	0
16	Barbastelle	Female	NB	50	5	55
17	Barbastelle	Female	PL	11	17	28
18	Barbastelle	Female	Juvenile	75	5	80

¹⁸ Data were not used for Bats 10 and 15 (that died after tagging) as the data was not considered representative of normal behaviour.

Bat number	Species	Sex	Status	Number of 'fixes' achieved.		
				Joint bearings	Single point	Total
19	Barbastelle	Male	Juvenile	16	5	21
20	Barbastelle	Female	PL	17	10	27
21	Natterer's bat	Female	PL	35	0	35
22	Natterer's bat	Female	NB	16	8	24

Breeding Female Barbastelles

The sample size of location fixes varied between the breeding female bats, with between 27 (bat 8) and 41 (bat 6) recorded for all bats except bat 13 (122). Bat 8 was recorded outside the Sizewell Estate briefly, in the RSPB Minsmere reserve, and as only one single point was achieved the 95% MCP excluded this most northerly point of record. As a result the MCP area for bat 8, measuring 128.1ha, may not represent the home range of this bat as well as for other bats. The mean MCP area for the seven breeding females was 271.6ha (range: 128.1-547.4ha) and excluding bat 8 was 295.5ha. The largest MCP area recorded was for bat 13 with a home range of 547.4ha. Bat 13 was recorded foraging extensively in the area surrounding Eastbridge, Goose Hill, Ash Wood Black Walks and Leiston Abbey woods. The 95% MCP of the non-breeding female (bat 16) was recorded as 319.5ha, which was similar to that of the breeding females.

The mean core area size (based on a 95% cluster analysis) of the breeding female barbastelle bats was 142.3ha (range: 19.6-226.8ha), with the number of core areas per bat ranging from one to six. Whilst a number of these cluster core areas overlap, there may be some partitioning of foraging habitat (see **Figure C26**) away from the main roosting area and central area of activity which appears to be centred on Ash Wood, Black Walks, Goose Hill, Leiston Old Abbey woodland and woodland adjacent to Plantation Cottages. The cluster size of the non-breeding female bat (bat 16 also on **Figure C26**) was 63.9ha.

The 95% kernel analysis recorded a median home range size of 303ha (range: 202.9-508.1ha), with 380ha for the single non-breeding female. The kernel analysis slightly expands the home range size of bats that foraged close to the sea wall by including part of the sea. The size of the kernel home ranges has not been adjusted for this.

Juvenile Barbastelles

The 95% MCP analysis of the data from the juvenile bats produced smaller home ranges than those of breeding females, with a mean of 184.9ha (range: 11.2-352.8ha). However, the tag came off bats 12 and 19 after three nights, so that a lower number of locational fixes were recorded for these bats and, as a result, these two bats have much smaller home range sizes than the other juveniles. If the home range of bat 12 is excluded the mean home range size increases to 219.6ha, and if 19 is also excluded it rises again to 263.8ha. The MCPs for the juvenile bats, other than bat 12 and 19, were comparable with those of the breeding female bats and these are likely to be a truer reflection of the likely home ranges for juvenile barbastelles.

The mean core area size (based on a 95% cluster analysis) of the juvenile bats was 76.4ha (range: 4.5-140ha). If the result for bat 12 is excluded, the mean size is 90.8ha with the number of core areas ranging from 2 to 4. There appears to be some overlap in foraging areas around

Ash Wood, Black Walks and the woodland adjacent to Plantation Cottages but also some partitioning further afield around Goose Hill, Nursery Covert and Leiston Old Abbey Woodland particularly between bats 5, 18 and to a lesser degree bat 19. The largest range and cluster size (120ha) was recorded for bat 18 and its foraging area extended as far south as Broom Covert and Rookyard Wood.

The 95% kernel analysis recorded a median size for the juvenile bats of 199.3ha (range: 20.4-352.8ha). The kernel sizes of bats 5 (239.2), 14 (199.3) and 18 (352.8) are similar to those of the breeding female bats.

Adult Male Barbastelle

Only one adult male bat was tracked. The male was not radio-tracked to the full extent of its home range as it was tracked only where it came close to or within the site. As a minimum size, the home range of this bat was recorded as at least 490.3ha. The 95% kernel analysis of the single adult male barbastelle bat produced a larger home range than those of all the other bats tracked at 663.6ha. In comparison, the 95% cluster analysis for the single adult male barbastelle bat resulted in a home range of 216ha with 2 core areas: the Sizewell Belts/Kenton Hills area and Old Abbey Farm and west of Leiston Abbey remains to Moat Farm. The difference between home range sizes using the different analyses is expected given that this bat ranged over a wide area but had two core areas for foraging which it used more regularly than the rest of the range it occupied.

3.1.6 Foraging Areas and Home Ranges of other Species

A 95% MCP, clusters and kernel analysis was carried out for each tagged bat. A summary of the MCP sizes is provided in **Table C4**. **Figures C20-C24** illustrate the results of MCP, clusters and kernel analysis for the four Natterer's bats and single brown long-eared bat that were tagged and tracked. The result of each analysis is set out below.

Natterer's Bat

The 95% MCP home range analysis for the four radio-tracked Natterer's bats produced a mean of 73.3ha (range: 58.2-117.4ha). The 95% cluster analysis home range resulted in smaller areas with a mean of 38.5ha (range: 13.8-64.8ha). There did not appear to be any overlap between home ranges of bats from the Abbey ruins and those caught in The Grove.

Brown Long-eared Bat

The 95% MCP home range for the single radio-tracked bat was 225.4ha, whilst the 95% cluster analysis resulted in an area of 50.5ha with four core areas. The 95% kernel analysis resulted in a home range area of 78.9ha.

3.2 Walked Transects

3.2.1 Survey Effort

Details of transect surveys are included in **Table 3.6** and a map of all walked transect survey routes combined is presented in **Figure D1**. A map of each transect route is included in **Figures D2-D13**. Two circuits of a transect route were completed on 10 May, 23 May, 7 June, 21 June, 18 July, 1 August, 22 August and 6 September.

Table 3.6 Details of Walked Transect Surveys in 2011¹⁹

Date	Area	Sunset/rise	Start	Finish	Surveyors*	Weather conditions
12/04	4	19:46	19:30	22:30	VA+SB	12-13°C, still, 50% cloud, dry
26/04	5	20:10	20:10	22:35	MH+SB	10.5°C, NE 3-4, 100% cloud, dry
10/05	3	20:35	20:25	22:52	MH+VA	14-13°C, still, 5% cloud, dry
23/05	1	20:53	20:53	23:46	MH+VA	15-13°C, SW 3-4, 0% cloud, dry
07/06	2	21:11	21:04	23:52	MH+VA	16-12°C, S 0-2, 0% cloud, dry
21/06	4	21:19	21:19	23:43	MH+LJ	16-13°C, no wind, 5% cloud, dry
05/07	5	04:40	02:30	04:31	MH+IH	14-15°C, NE 2, 0% cloud, dry
18/07	3	21:05	21:20	00:01	MH+IH	14°C, SW 1-2, 100% cloud, dry after heavy rain
01/08	1	20:45	20:40	23:26	VA+SB	16°C, E 3, 5% cloud, dry
22/08	2	20:04	19:52	22:25	MH+IH	16-17°C, NE 2-3, 20% cloud, dry
06/09	4	19:31	19:27	21:40	VA+MH	15°C, W 3, 100% cloud, dry
29/09	5	18:37	18:37	21:12	MH+PS	15°C, no wind, 0% cloud, dry

3.2.2 Relative Activity of Bats

In total 1,492 bat passes of at least nine species of bats were recorded during walked transect surveys in 2011. Across the survey season, soprano pipistrelle was the most frequently encountered species on walked transects with a mean of 24.9 bats per hour (B/h) and 51.3% of all passes were recorded as this species (n = 766). The common pipistrelle was the second most numerous with 12.6 B/h and common/soprano pipistrelle the third with 4B/h. Relative activity of less than 1 B/h was recorded for all other species or grouped species categories with the exception of barbastelle and Leisler's bat/serotine for which 2.3 and 1.1 B/h respectively was recorded. **Table 3.7** summarises the relative activity level recorded during walked transects for all species or grouped species categories. Full details of the number of passes and species recorded during each transect survey are included in **Table D1**.

¹⁹ Wind strength is given in the Beaufort scale and wind direction is abbreviated to an eight point compass (e.g. NE = north-east). The Beaufort scale is an empirical measure that relates wind speed to observed conditions at sea or on land, e.g. 0 = calm, 1 = light air, 2 = light breeze, 3 = gentle breeze etc.

Table 3.7 Relative Bat Activity Recorded during Walked Transects in 2011

Species	Total no. of passes	B/h	% of total
Soprano pipistrelle	766	24.9	51.3
Common pipistrelle	388	12.6	26.0
Common/soprano pipistrelle	124	4.0	8.3
Barbastelle	71	2.3	4.8
Leisler's bat / serotine	33	1.1	2.2
Serotine	28	0.9	1.9
Myotis species	24	0.8	1.6
Noctule	19	0.6	1.3
<i>Nyctalus</i> species	7	0.2	0.5
Leisler's bat	3	0.1	0.2
Common/ Nathusius' pipistrelle	2	0.1	0.1
Nathusius' pipistrelle	23	0.7	1.5
Brown long-eared bat	4	0.1	0.3

Bat activity levels varied between transects, with a minimum of 10.5 B/h (29 September) and a maximum of 133.7 B/h (12 April – almost exclusively pipistrelles). The average relative activity level for all bat species combined was 48.5 B/h. Fluctuations between surveys are normal, being influenced by short-term variations in weather conditions and prey availability and seasonal variations such as the increase in the abundance of bats in the late summer due to the presence of juveniles.

3.2.3 Spatial Distribution of Bats

The spatial distribution of all bat records from walked transects, with the exception of common and soprano pipistrelle bats, is illustrated in **Figure D14**. Records of these two species are particularly numerous and they are found in most areas of the site and are therefore excluded from this figure.

Barbastelle

Barbastelle was recorded on six of the 12 walked transects in 2010 and were frequently recorded in Areas 1 and 4, particularly around Ash Wood and in Goose Hill (see **Figure D14**). A summary of barbastelle records is given below.

23 May – 10 passes were recorded in Area 1. The first three were recorded on the west side of Ash Wood 40-45 minutes after sunset (close to emergence time), with another five passes on the track through Black Walks, one along the shelter belt north of Ash Wood and one on the track between the Round House and Black Walks.

21 June – three passes were recorded in Area 4. The first was 42 minutes after sunset on the track east of the central crossroads in Goose Hill. Single passes were also recorded on the northern edge of the Belts and at the central crossroads.

18 July– three passes were recorded in Area 3. The first two were 58-60 minutes after sunset at the southern end of Upper Abbey track. A single pass was also recorded to the west of Upper Abbey Barn.

1 August – 32 passes were recorded in Area 1. The first two were 50 minutes after sunset at the south-west corner of Ash Wood with several more on the east side of Ash Wood and in the north-east corner of the arable field north of Ash Wood. Another cluster of 17 passes, including feeding buzzes, was recorded on the south-west perimeter of Ash Wood.

22 August – A single pass was recorded in Area 2, 53 minutes after sunset on the eastern edge of the young plantation to the west of The Grove.

6 September – 24 passes were recorded in Area 4. The first were 32-33 minutes after sunset along the north-east edge of Goose Hill where passes were recorded again later during the transect, with a further cluster of 19 passes in the north-east part of Goose Hill and another pass just north of Turf Pits.

Other Species

Noctule was recorded infrequently and in low numbers with just 19 passes recorded. Most passes were recorded around the north-east edge of Goose Hill and also on the west side of The Grove with a scatter of single passes elsewhere. Only one pass was recorded close to sunset.

Leisler's bat was recorded on three dates as in 2010: 21 June (Goose Hill), 1 August (north edge of Ash Wood) and 6 September (Goose Hill).

Serotine was not recorded until 21 June when an estimated 20 bats were seen foraging along rides in the northern part of Goose Hill, with groups of 3-5 bats patrolling along the rides below canopy height. Fewer serotines were recorded in similar areas on 6 September and a single pass was recorded just north of Kenton Hills on 18 July.

As in 2010, there were few records of brown long-eared bat with single passes at Ash Wood and Walk Barn and two in Goose Hill. This species is difficult to detect and is likely to be much more abundant than the lack of records suggest given the presence of known roosts and the frequency with which they are caught: 7% and 12% of all bats caught in 2010 and 2011 respectively (see Section 3.1.1 for 2011 trapping results).

Common and soprano pipistrelle bats were recorded during every survey and occurred in most of the survey area.

Nathusius' pipistrelle was recorded on one survey (12 April) with 23 passes recorded in the north-east of Goose Hill and along the southern edge of the Grove.

A low total of 24 passes of *Myotis* bats were recorded with a relatively wide scatter of records. The highest proportion of passes was recorded in Goose Hill.

3.3 Static Bat Detector Survey

3.3.1 Survey Effort

Static bat detectors were operating for a total of 939 detector nights, equating to 8,477 hours (sunset-sunrise each night) throughout the survey season and all data were used in the analysis for Group 1 bats. After three nights were selected for analysis for Group 2 bat species (see Section 2.6.1), this total was reduced to 1,703 hours of survey time. **Figures E1** and **E2** show the location of all static bat detectors. **Table E1** gives details of static bat detector deployment dates and locations with relative activity rates (B/h) for all bats and the minimum number of species²⁰ recorded at each location shown in **Table E2**. **Table 3.8** shows the number of successful detector deployments in each sub-survey area and in each season.

Table 3.8 Number of Successful Detector Deployments by Sub-Survey Area and Period

Area name	Area no.	Number of successfully deployed detectors		
		Period 1	Period 2	Period 3
		12/04 – 19/06	20/06 – 5/09	06/09 - 28/09
Ash Wood and farmland (north-west)	1	6	6	6
Farmland (north-east)	2	6	6	6
Farmland (west)	3	6	5	6
Goose Hill	4	5	6	6
The Belts (north-east) and main site	5	6	6	6

3.3.2 Relative Activity of all Bats

In total 65,310 bat passes of the six Group 2 species (see Section 2.6.1) were recorded at an average rate of 43 B/h with a further 10,266 passes of three Group 1 species (barbastelle, Nathusius' pipistrelle and Leisler's bat) at 1.21 B/h. The same species recorded during walked transects were recorded during static surveys.

Table 3.9 summarises the relative activity levels recorded during static detector surveys for all species or grouped species categories. The relative activity level and spatial distribution of each species or species group are described in turn below.

²⁰ For some categories, i.e. *Myotis* bats, more than one species of bat may have been recorded and the total is a minimum number of species.

Table 3.9 Relative Activity Level Recorded during Static Bat Detector Survey for Both Group 1 and 2 Species (See Section 2.6.1) in 2011

Species	Total no. of passes	B/h
<i>Group 1 species</i>		
Leisler's bat	1606	0.2
Nathusius' pipistrelle	2242	0.3
Barbastelle	6418	0.8
<i>Group 2 species</i>		
Noctule	1323	0.8
<i>Nyctalus</i> species	61	0.0
Leisler's bat /serotine	1014	0.6
Serotine	846	0.5
<i>Nyctalus/Eptesicus</i>	3	0.0
Soprano pipistrelle	39,695	23.3
Common pipistrelle	26,162	15.4
Common/soprano pipistrelle	1773	1.0
Common/ Nathusius' pipistrelle	115	0.1
<i>Myotis</i> species	1840	1.1
Brown long-eared bat	259	0.2
<i>Myotis/Plecotus</i>	107	0.1
<i>Plecotus/Eptesicus</i>	61	0.0
Total	83,525	44.7
<i>Group 1</i>	10266	1.2
<i>Group 2</i>	73,259	43.0

3.3.3 Relative Activity of Group 1 Bats

Barbastelle

The relative activity of barbastelle at each static detector survey location is illustrated in **Figure E3** with **Figures E4** and **E5** showing the relative activity at survey locations in spring and summer respectively.

In total, 6,418 barbastelle passes were recorded at an average rate of 0.8 B/h, which is a higher rate than in 2010 (0.5 B/h). Barbastelle bats were recorded from 57 of the 63 static detector locations. In general, higher activity rates were recorded during the summer (1.1 B/h) than the spring (0.65 B/h) although this difference was not as marked as in 2010, and this was not true of all areas. **Figure 3.1** shows how barbastelle activity varied between sub-survey areas and time periods. The highest activity levels were recorded in Area 1, namely Ash Wood and farmland (north-west) (mean 1.4 B/h). Similar mean activity levels were recorded in Areas 2 (0.8 B/h), 3

(0.9 B/h) and 4 (0.8 B/h). The lowest activity levels were recorded in Area 5 (0.4 B/h). Significantly higher summer activity levels were recorded in Areas 2, 4 and 5 and higher spring activity was recorded in Area 3 with activity consistent between spring and summer in Area 1.

The nocturnal activity patterns of barbastelle were broadly similar to those in 2010 with bats typically being recorded first by detectors at around 40 minutes after sunset, although this fell to around 30 minutes later in the season as the evening twilight period shortened. An overall peak in activity was recorded between 40 and 80 minutes after sunset with a decline towards the middle of the night and then a second peak between 120 and 80 minutes before sunrise with very few records after 40 minutes before sunrise (see **Figure 3.2**). This is a typical activity pattern for most bat species with many bats using night roosts during the middle period of the night and having two clear activity (commuting and foraging) peaks at the beginning and end of the night. There was little variation in this pattern between the spring and summer in 2011. **Figures E6** and **E7** show the static bat detector locations where barbastelle feeding calls were recorded and also the locations where peaks in activity early and late in the night were recorded, in spring and summer/autumn. The former may indicate foraging areas and the latter may suggest that barbastelles were commuting past these detectors on their way to or from a roost. However, several of the areas where the highest numbers of foraging calls were recorded were also areas where there was strong activity both early and late and it is more likely that these areas are important for foraging, rather than commuting. Although relatively few feeding calls were recorded overall (n=114), barbastelle feeding calls are particularly quiet and difficult to detect and this should not be taken as indicating a lack of foraging activity on the site.

Figure 3.1 Barbastelle Relative Activity By Survey Area (1-5) And Period

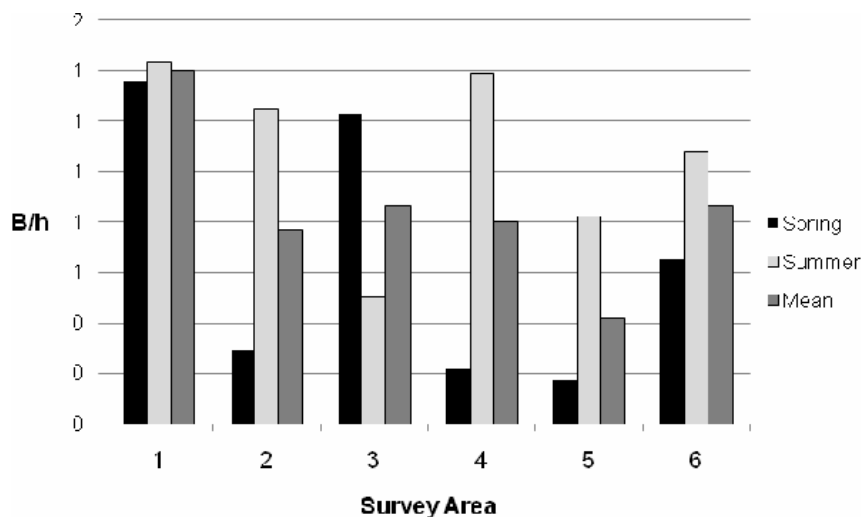
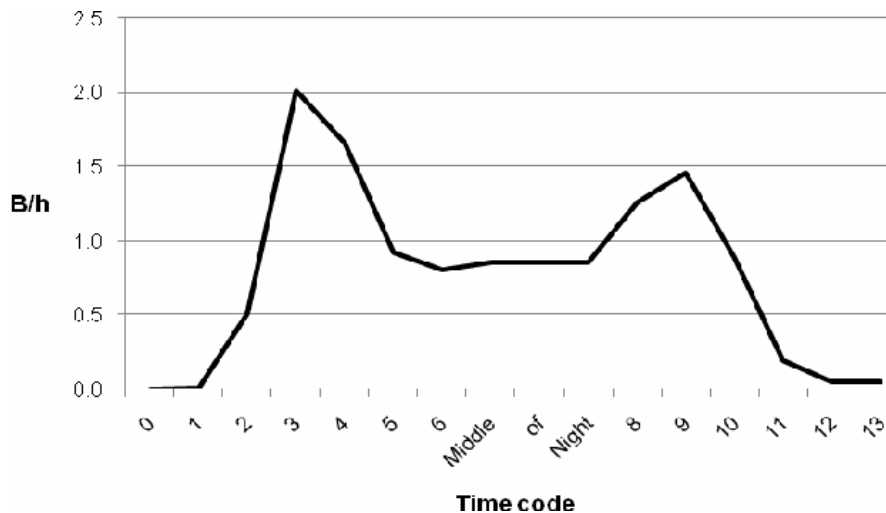


Figure 3.2 Barbastelle relative activity patterns in relation to sunset and sunrise. The 'Middle of Night' label on the X-axis = Time Code 7.

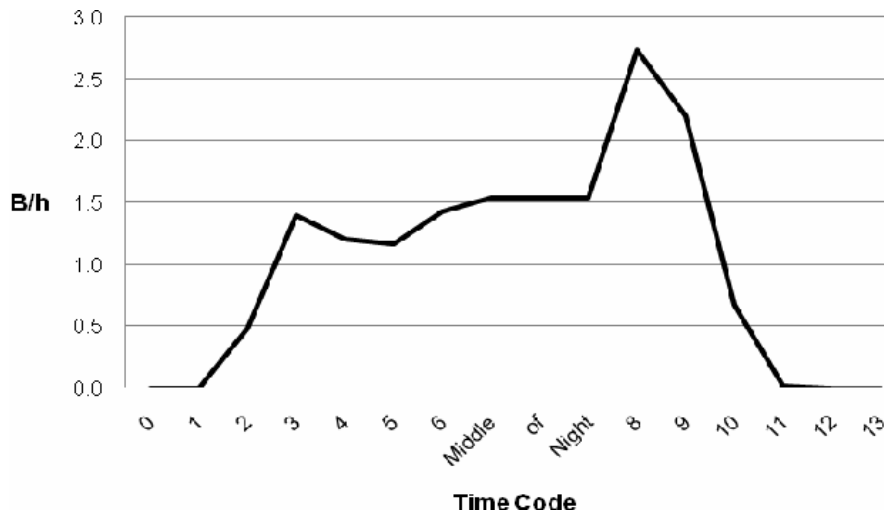


Area 1 - Ash Wood and farmland (north-west)

The highest levels of barbastelle activity were recorded in Area 1 and this is likely to be because Area 1 contains Ash Wood, which was the most frequently used roost area during the radio-tracking survey in 2011. As in 2010, the highest level of activity (3.6 B/h in spring and 3.0 B/h in summer) recorded in Area 1 was along the defunct hawthorn hedge at Black Walks during May-June and August. The peak of activity (as in 2010) was recorded in the middle of the night rather than at commuting times close to sunset and sunrise with 67% of all calls (n = 662) during the middle of the night (TC 7). This pattern was also found at the north, east and south sides of Ash Wood with most activity recorded during the middle and end of the night (see **Figure 3.3**). These areas may be used by bats that night-roost in Ash Wood and intermittently forage nearby during the middle of the night. The late peak in activity may indicate that bats are foraging towards the end of the night before returning to the roost.

Activity levels indicate that barbastelles are recorded on all sides of the wood although the highest was recorded on the east side and, although a detector was not placed on the west side, walked transects recorded several passes along this edge (see Section 3.2.3). Another strong feature that is used by barbastelle is Upper Abbey track (August, 1.19 B/h) and a detector was positioned in the northern part in May-June when good activity levels were recorded (3 B/h) and latterly in September when, unusually, no barbastelles were recorded. A similar pattern of a spring peak in activity was also recorded at the detector further south along the track (see the summary for Area 3).

Figure 3.3 Barbastelle relative activity patterns in relation to sunset and sunrise in Area 1. The 'Middle of Night' label on the X-axis = Time Code 7.



Area 2 – Farmland (north-east)

The selection of detector positions in Area 2 in 2011 focussed on determining commuting routes used by barbastelles between Ash Wood and The Grove (the two key maternity roost areas identified in 2010). Detectors 5b, 5c, 5d and 5e were all located along such potential flyways with 5f in The Grove close to 2 known roost trees used in 2010 and 5a at the northern tip of The Grove on the edge of the Minsmere Levels. The results are inconclusive with high variability in activity levels between detectors and survey periods. Activity levels were higher in summer (1.3 B/h) than spring (0.3 B/h) but this is skewed by the very high level of activity recorded on a hedge just east of Ash Wood at detector 5b in August-September (5.3 B/h) which contrasts markedly with the figure from the same location in the spring (0.1 B/h). All other activity levels were below 1 B/h with the exception of the ride between Walk Barn and the southern edge of the Grove where 1.3 B/h was recorded in August-September. Although barbastelles were recorded at all detector locations, low activity levels indicate that none is of particular importance for commuting between the two roost areas. In comparison to 2009, the detector location at the northern end of the Grove recorded higher levels of barbastelle activity, particularly in June (0.6 B/h). The detector location close to roost trees in The Grove recorded low activity levels in June (<0.1 B/h) but higher activity levels in August/September (0.5 B/h), which may suggest that bats were not roosting in this area during the pre-maternity period. During June 2010 several radio-tracked female barbastelles used tree roosts in The Grove but none did so in August 2011.

Area 3 – Farmland (west)

Area 3 is the only part of the site where significantly higher barbastelle activity was recorded during spring (1.2 B/h) than summer (0.5 B/h). This was true of all six detector locations and is difficult to explain. One of the highest activity levels in 2011 was recorded on the southern section of Upper Abbey track (3d: 4.7 B/h) in May but this decreased to 0.8 B/h by July. This was also true of location 3b, located on the edge of a strip of mature woodland, where 1.3 B/h were recorded in May but only 0.2 B/h in July. At detector location 3c 2.7 B/h were recorded in

spring 2010 but only 0.4 B/h in May and no barbastelles in July 2011. At both locations in the arable area to the east of Upper Abbey track moderate levels of barbastelle activity were recorded in May and again no barbastelles in July. Overall, the highest levels of activity were recorded in the early part of the night (TC 2-3: 1.9B/h) and particularly at 3d in May (TC 2-3: 14.9B/h). It is possible that the July deployment (July 17-31) may have coincided with the birth of young barbastelles and that female bats may have been foraging close to breeding colonies in order to be able to suckle their young regularly.

Area 4 – Goose Hill

Barbastelle relative activity around Goose Hill was similar to that during 2010 with a mean of 0.8 B/h (0.5 B/h in 2010) over the survey season. It was, as in 2010, significantly higher in the summer (1.4 B/h) than the spring (0.2 B/h) and this does not relate to the movement of detectors as all detectors were in the same locations in spring and summer. However, detectors were deployed in April before the maternity colony would have developed and while the nights are still cold. As a consequence, activity levels of barbastelle were low in this month (both in 2010 and 2011). Three detectors recorded high activity levels in the summer: 1a at Stonewall Belt (3.1 B/h); 1b just north of Turf Pits (1.8 B/h); and 1e at the junction of two rides in the eastern part of Goose Hill (2.2 B/h).

Activity levels in Area 4 peaked during the first and the last part of the night (TC 2-4: 1.9 B/h; TC 8-10: 1.6 B/h) which indicates that Goose Hill is a core foraging/commuting area for barbastelles. A similar pattern was found during 2010.

Area 5 – The Belts (north-east) and main site

As in 2010, static detectors in Area 5 recorded fairly low levels of activity in the spring (0.2 B/h) with a peak in summer (0.8 B/h). However, there were some differences in where and when activity was recorded between the years. Four of the detector locations (of seven) recorded less than 0.1 B/h during each period. The highest activity rate by far was recorded at a new location that was used in July (P2 2a: 4.7 B/h) and September (P3 1a: 0.4 B/h) 2011. This location was within damp ruderal vegetation just north of a reedbed and lake on the northern edge of the SSSI woodland area. It was noted in 2010 and 2011 that large numbers of moths and butterflies were feeding on abundant thistles and other plants in this area during July and August and it is possible that barbastelles were exploiting this seasonal prey resource during July and, to a lesser extent, in September. Reasonably high activity levels were also recorded at a new location on a bund on the edge of the main site. Previous detector deployments within the main site and along the bund have recorded very low levels of activity but 1.1 B/h were recorded at location P3 1g during a period of fairly poor weather when activity was generally low.

Activity levels for Area 5 showed a very similar pattern to 2010, with an early peak of activity evident as was found during the radio-tracking study, with 40% of passes (n = 409; 1.6 B/h) between 40 and 80 minutes after sunset. This was particularly pronounced for P2 2a with 58% of passes (n = 297; 37.1 B/h) during this period of the night with a comparatively high number of foraging calls also recorded (n = 12). The 2011 data confirms that parts of the northern Belts are a core foraging area for barbastelle during the early part of the night.

Leisler's Bat

The relative activity of Leisler's bat at each static detector survey location is illustrated in **Figure E8** with **Figures E9** and **E10** showing the relative activity at survey locations in spring and summer respectively. Calls identified as Leisler's bat/serotine and Leisler's bat/noctule are included with the Group 2 bat call analysis (see Section 2.6.1).

In total, 1606 Leisler's passes (0.2 B/h) were recorded, with higher activity levels recorded in summer (0.4 B/h) than in spring (0.1 B/h). This species was recorded from 35 deployments with 22 of those during the summer.

Moderate activity levels were recorded in Areas 1, 3 and 4 with similar activity levels recorded in Areas 1 and 3 in the spring and summer, but in Area 4 (Goose Hill) no bats were recorded in spring and 1 B/h in summer. Activity levels of more than 1 B/h were only recorded from four deployments. The highest of these were in the north-east corner of Goose Hill (P2 1d) in June/July (3.1 B/h) and on the northern edge of Ash Wood (P2 4b) in August. As in 2010 little activity was recorded early in the night with only two passes recorded before 40 minutes after sunset, with peak activity during the period 60-120 minutes after sunset (0.6 B/h). The low activity rates and lack of early records suggests that the Sizewell Estate does not support any large roosts of this species.

Nathusius' Pipistrelle

The relative activity of Nathusius' pipistrelle at each static detector survey location is illustrated in **Figure E11**, with **Figures E12-E14** showing the relative activity at survey locations in spring, summer and autumn (see Section 2.4.1) respectively. Calls identified as either common pipistrelle or Nathusius' pipistrelle are also included with the Group 2 bat call analysis (see Section 2.6.1).

In total 2,242 Nathusius' pipistrelle passes (0.3 B/h) were recorded, with much higher activity levels recorded in the spring (0.6 B/h) than in the summer or autumn (<0.1 B/h for both). Nathusius' pipistrelle was recorded from all detector locations in the spring (n = 30), 19 in the summer and all six in the autumn. The seasonal pattern of the recorded calls was different to 2010 with activity high during April – mid May and then very low during the rest of the season. In 2010 activity was high in spring and autumn and moderate over the Sizewell Belts in summer.

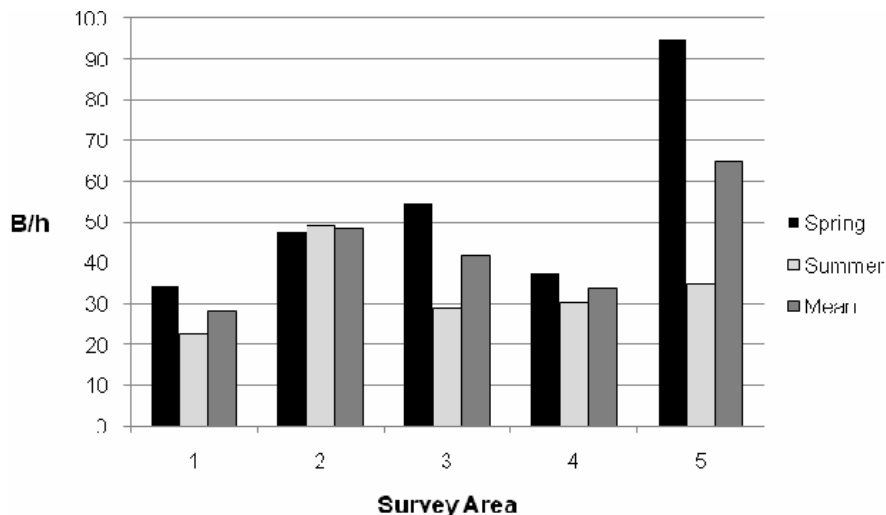
During April/May 2011 the highest activity levels were all recorded in open areas near the coast, particularly at P1 2c in the north-east Belts (6.7 B/h); at P1 1d on the edge of the heathland/grazing marsh in the north-east corner of Goose Hill; and at P1 2f on the bund at the north-east corner of the power station (1.8 B/h). During the summer, sporadic activity was recorded at several detector locations with more than 0.1 B/h only recorded at two locations: at P1 5b (0.5 B/h) on the edge of the Minsmere marshes in June and at P2 1d (see above; 0.2 B/h). Activity was low during the summer in the northern part of the Belts, in contrast to 2010. Also, during 2010 there was a noticeable and apparently synchronous arrival of Nathusius' pipistrelle and migrant birds in early September. During late August/September 2011 there were apparently no significant arrivals of bats across the North Sea and it was noticeable that there were also no notable arrivals of migrant birds on the East Anglian coast during this period of prevailing westerly winds.

3.3.4 Relative Activity of Group 2 Bats

All detectors that were deployed recorded bats. There was variation in bat activity recorded between different areas and in different seasons as is shown in **Figure 3.4**. There was a noticeable decrease in bat activity from the spring (53.78 B/h) to the summer (33.2 B/h), in contrast to 2010 when this trend was reversed. This was true of all survey areas, except Area 2 where the activity levels were fairly even between the seasons. The highest activity levels were recorded from Area 5 (The Belts and main site: 64.8 B/h) with a very high spring peak of 94.8

B/h. Activity levels on the main site were generally low but they were very high in the north-eastern part of the Sizewell Belts. Activity levels from Area 2 (Farmland NE) were also high (48.5 B/h).

Figure 3.4 Relative Activity of all Group 2 Bat Species by Survey Area (1-5) and Period



The highest activity levels came from five detectors that each recorded more than 120 B/h as follows:

1. P1 2c (367.8 B/h) - located on the north-eastern corner of the Belts in Area 5 in April/May. High activity levels of all three species of pipistrelle bats were recorded, as well as significant *Myotis* activity.
2. P1 5f (152.3 B/h) - located in The Grove in June. The large majority of passes were from pipistrelle bats, principally soprano pipistrelles.
3. P1 2b (144.1 B/h) – located in a stand of silver birches in the wooded part of the SSSI area in April/May. The large majority of passes were from pipistrelle bats, principally soprano pipistrelles.
4. P1 4f (127.9 B/h) – located on the northern part of the Upper Abbey track in May. High levels of activity were recorded from common and soprano pipistrelle bats..
5. P2 5a (127.7 B/h) – located at the northern end of The Grove adjacent to a ditch and facing grazing marshes at Minsmere. The large majority of passes were from pipistrelle bats, principally soprano pipistrelles.

***Myotis* Bats**

The relative activity of *Myotis* bats at each static detector survey location is illustrated in **Figure E15** with **Figures E16** and **E17** showing the relative activity at survey locations in spring and summer respectively. In total, 1,835 *Myotis* passes were recorded at an average rate of 1.1 B/h, which was slightly higher than in 2010 (0.8 B/h). *Myotis* bats were recorded from 60 of the 63

static locations. Higher activity rates were recorded in the summer (1.5 B/h) than the spring (0.8 B/h)

Similar activity levels were recorded in Areas 1, 3 and 4 (0.5-0.9 B/h). The highest activity level was recorded in Area 2 (2.2 B/h) and particularly around The Grove in August and September, when 10.1 B/h was recorded at location 5f in The Grove with 4.2 B/h at 5e on a track to the south of The Grove. The activity level in Area 5 was also higher (1.1 B/h) and this due to the activity of (presumed) Daubenton's bats in the northern Belts. *Myotis* bats are clearly widely distributed over the survey area and are present throughout the active period.

The nocturnal activity of *Myotis* bats showed a similar pattern to that of barbastelle, with bats typically being recorded first by detectors at around 40 minutes after sunset, with a peak around 60 minutes after sunset and a smaller secondary peak around 60 minutes before sunrise, as in 2010.

Noctule and *Nyctalus* sp

The relative activity of noctule bat at each static detector survey location is illustrated in **Figure E18** with **Figures E19** and **E20** showing the relative activity at different survey locations in spring and summer respectively. In total, 1323 noctule passes were recorded at an average rate of 0.8 B/h which is higher than in 2010 (0.3 B/h). A further 61 *Nyctalus* sp. passes were recorded (<0.1 B/h) and these will not be analysed in detail. Noctules were recorded from 53 static detector deployments: 23 in spring, 25 in summer and five in autumn. Similar activity rates were recorded for noctule in the spring (0.8 B/h) and summer (0.9 B/h).

Highest noctule activity rates were recorded in Areas 2 (1.3 B/h) and 4 (1.7 B/h), with similar activity rates for the other three areas (0.4-0.5 B/h). In Area 2 activity levels were much higher in the spring (2.5 B/h) than in the summer (0.4 B/h) and the opposite was true of Area 4 with 0.4 B/h in spring and 3 B/h in summer. Three detectors recorded higher levels of activity than others: P1 5e on the southern edge of The Grove in June recorded 12.9 B/h, principally during the middle of the night; P2 1e in south-east Goose Hill recorded 9.7 B/h with most activity between 40 and 100 minutes after sunset; and P2 1d in the north-eastern corner of Goose Hill recorded 5.8 B/h with a peak 40-80 minutes after sunset. All three detectors were located in the eastern part of Goose Hill. Although activity rates for noctule were higher than in 2010, there is still no evidence that the Sizewell Estate supports any large roosts of this species, given the low activity rates recorded and the lack of early records for a species that generally emerges from its roosts close to sunset.

Pipistrelle Bats

This section covers both common and soprano pipistrelle and also any pipistrelle calls that could have been from either species (see Section 2.6.2). The relative activity of common and soprano pipistrelle at each static detector survey location is illustrated in **Figures E21** and **E24** respectively, with **Figures E22-E23** and **E25-E26** respectively illustrating the relative activity levels at different survey locations in spring and summer.

In total, 26,162 common pipistrelle passes were recorded (15.4 B/h), with 39,695 soprano pipistrelle (23.3 B/h), and a total of 1,888 unidentified pipistrelle passes (1.1 B/h); 93.5% of these calls were therefore recorded to species. Common and soprano pipistrelle bats were recorded from all detectors in all seasons. Much higher activity rates were recorded for common pipistrelle in the spring (26.9 B/h) than the summer (8.1 B/h) and autumn (4.1 B/h). This was

also true for soprano pipistrelle, with 26.3 B/h in spring, 21 B/h in summer and 22.2 B/h in autumn.

An analysis of pipistrelle activity within the different survey areas shows that there are small differences in the spatial distribution of records for both species although there are overlaps between them. In the spring the highest activity levels for common pipistrelle were in Areas 3 (38.1 B/h) and 5 (46.4 B/h), particularly in the northern Belts and along the edge of the woodland near Old Abbey Farm. For soprano pipistrelle, peaks of recorded activity were in the Belts, north-east Goose Hill and The Grove and along Upper Abbey track. During the summer common pipistrelle activity was reduced, with fairly consistent activity levels across areas and a peak in Area 1 (14.3 B/h). For soprano pipistrelle, the highest levels of activity were recorded in grazing marsh or wet woodland areas, in Areas 2 (40.6 B/h) and 5 (28.8 B/h).

Serotine

The relative activity of serotine and calls identified as either serotine or Leisler's bat at each static detector survey location is illustrated in **Figures E27** and **E30** with **Figures E28-E29** and **E31-E32** showing the relative activity at different survey locations in spring and summer respectively.

In total, 856 serotine passes were recorded at an average rate of 0.5 B/h with a further 1014 serotine/Leisler's passes (0.6 B/h). Serotine bats were recorded from 23 detector locations with seven in spring (<0.1 B/h) and 16 in summer (1.1 B/h). Serotine/Leisler's passes were also more frequently recorded in spring (0.1 B/h) than summer (1.2 B/h). Serotines were recorded regularly from very few detectors and were quite local in their distribution. More than 1 B/h was recorded from only one detector, on Upper Abbey track in July (30.9 B/h). Given the observation of up to 20 serotines on a transect in Goose Hill on June 21 and the trapping of nine serotines in August (seven on the edge of Goose Hill) it is surprising that more serotines were not recorded in Goose Hill at the end of June. However, quite high levels of serotine/Leisler's activity were recorded in Goose Hill in summer (4.1 B/h) and it is likely that most of these were serotine bats. No serotines were recorded within the first half hour after sunset which suggests that the site is not close to any significant roosts although it is important to note that four of the nine bats caught were females that had bred that year.

Brown Long Eared Bat

The relative activity of brown long-eared bat at each static detector survey location is illustrated in **Figure E33** with **Figures E34** and **E35** showing the relative activity at different survey locations in spring and summer respectively.

In total, 259 brown long-eared bat passes were recorded at an average rate of 0.2 B/h. Brown long-eared bats were recorded from 29 of the 56 static locations with 20 in spring, 21 in summer and five in autumn. Brown long-eared bat were recorded occasionally from a number of detectors and are quite widespread in their distribution. All detectors recorded fairly low activity levels with only two detectors recording more than twenty passes from this species, in the SSSI birch woodland (P2 2b: 20 passes) and on the east side of Ash Wood (P2 4c: 36 passes) near to a known colony in Ash Cottage. The lack of Anabat data from this species stands in contrast to a total of bats caught (12% of total) and reflects the fact that this species is very difficult to detect using bat detectors, having a quiet call and even foraging using passive listening as opposed to echolocation.

It is not possible to conduct a meaningful analysis of nocturnal activity patterns of brown long-eared bat owing to the low levels of activity recorded.

3.4 Roost Surveys

3.4.1 Upper Abbey Barn

Inspection Survey

Upper Abbey Barn is approximately 28m long by 11m wide. It has a wooden beam frame and queen-post structure with traditional mortise joints. The thatched pitched roof is approximately 15m high at the apex and sections of the thatched roof on the northern side of the barn have been repaired with corrugated metal sheets and some wooden boards in various sections were replaced in February 2011. The walls are constructed from sawn, single thickness, overlapping boards and there are two large double doors on the southern side of barn.

During the daytime internal inspections of Upper Abbey Barn in June and August, Natterer's, brown long-eared/barbastelle and pipistrelle bat droppings were recorded in the barn. An accumulation of old (probably around a year old) Natterer's bat droppings were recorded in one location in the centre of the barn, underneath the third main post in from the eastern end of the barn. The droppings were directly under a mortise joint connecting the roof beams. No bats were found during close inspection of the joint from a ladder but there was a reasonably large cavity within the joint and noticeable grease staining caused by the movement of bats in and out of the cavity. At least three other mortise joints were inspected that had similar staining around the entrance to the cavity behind, although only a scatter of droppings was found below these.

No other accumulations of droppings were found despite inspection of all accessible surfaces within the barn where they might gather. A general scatter of old and fresh pipistrelle and Natterer's bat droppings were found in most areas of the barn and a few fresh droppings that were thought to be either from barbastelle or brown long-eared bats²¹ was also found. No new evidence of bats was found during the second survey in August. The two bat boxes within the barn were inspected during both visits and no bats were found, although three brown long-eared bat/barbastelle droppings were found in the western box. The static bat detector surveys also suggest that the droppings found in the barn that could not be distinguished as brown long-eared bat or barbastelle are more likely to be barbastelle given the much higher activity rate for this species and the direct evidence of roosting provided by the surveys (see below).

Emergence/Re-entry Survey

Details of the dusk emergence and the dawn re-entry surveys are provided in **Table 3.10**.

²¹ These two species are difficult to separate on the basis of their droppings alone. Droppings were compared to those from both species held by BSG.

Table 3.10 Details of Emergence-Re-Entry Surveys at Upper Abbey Barn in 2011²²

Date	Sunset/rise	Start	Finish	Surveyors	Weather conditions
20/06	21:19	21:05	23:20	MH+IH+LJ	16°C, SW 1-2, 90% cloud, intermittent light rain
03/08	05:17	03:15	05:30	VA+SB+PS	15°C, S1, 70% cloud, dry

During the emergence survey on 20 June, a single soprano pipistrelle emerged from the top of the western gable end at 21:31 at 12 minutes after sunset; two common pipistrelle bats were seen emerging from the top of the eastern gable end of the barn at 21:42 and 21:44 at 23 and 25 minutes after sunset; and a soprano pipistrelle emerged from a crack at a height of 1.5m on the southern wall at 21:40 at 21 minutes after sunset. A single noctule flew over the barn at 21:30 and a barbastelle was recorded at the south-eastern corner of the barn at 22:04 but was not seen. The barbastelle may have emerged from the barn or it may have been commuting past the barn.

During the re-entry survey on 3 August, several bats re-entered the barn through gaps between boards on the front wall (south) of the barn: a *Myotis* bat re-entered the barn at 04:04 (73 minutes before sunrise), a soprano pipistrelle at 04:35 (42 minutes before sunrise) and a *Myotis* bat at 04:43 (34 minutes before sunrise). In addition a soprano pipistrelle re-entered the barn through a gap between two boards half-way up the eastern gable at 04:53 (18 minutes before sunrise).

Static Bat Detector Survey

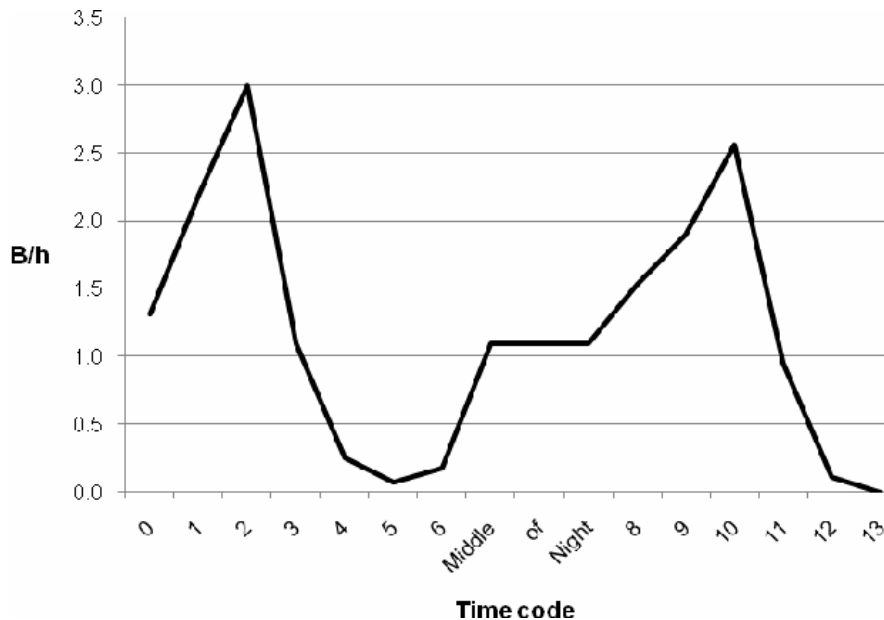
A total of 8985 bat passes (excluding common and soprano pipistrelle) were recorded from Upper Abbey Barn at 10.8 B/h. This total includes 866 barbastelle passes (1 B/h), 8112 *Myotis* bat passes (9.7 B/h) and just seven passes from brown long-eared bats. The latter species will not be considered further as such a low level of activity indicates that this species visits the barn sporadically, perhaps as a night roost or to forage, albeit their quiet call means that they may have been under-recorded to some extent.

Barbastelle

The distribution of recorded barbastelle calls inside the barn was not uniform with respect to either time of night or the survey period. **Figure 3.5** shows the distribution of recorded barbastelle calls by time of night. There was a fairly consistent pattern of activity at particular times of night for barbastelles across survey periods.

²² Wind strength is given in the Beaufort scale and wind direction is abbreviated to an eight point compass (e.g. NE = north-east).

Figure 3.5 Barbastelle relative activity patterns in relation to sunset and sunrise in Upper Abbey Barn. The 'Middle of Night' label on the X-axis = Time Code 7

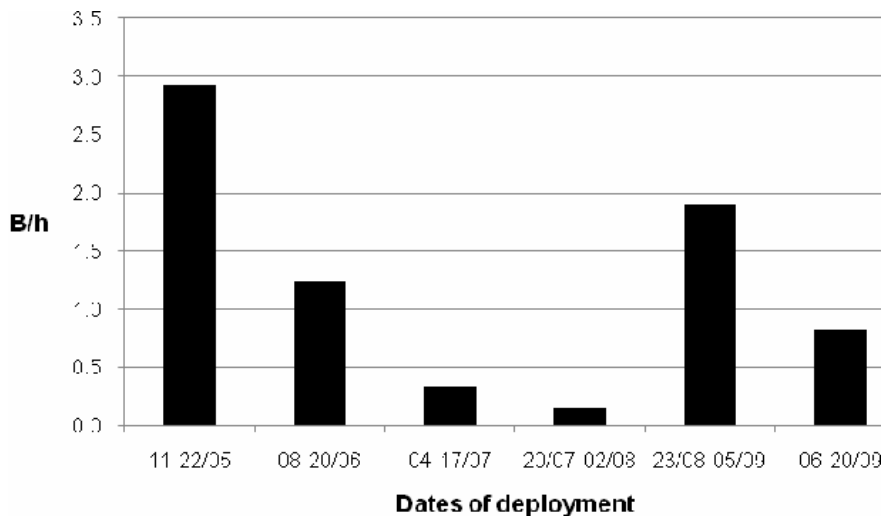


Barbastelles were active in the barn from early in the evening with peak activity around 0-40 minutes after sunset (TC 1-2: 2.6 B/h) with some activity recorded before sunset (TC 0: 1.3 B/h), although all passes before sunset were recorded in September, except for one in May. Activity dropped during the second hour after sunset (0.2 B/h) but then rose again during the middle of the night (TC7: 1.1 B/h) when 92% of foraging calls were recorded (n = 12). During the latter half of the night there was a steady increase in activity until the peak at 100-60 minutes before sunrise (TC 9-10: 2.3 B/h), after which there was a steady decline with occasional bats recorded until 19 minutes before sunrise. This activity pattern strongly indicates that barbastelles are roosting in the barn and light-sampling before emergence. If we take presence of barbastelle inside the barn within 40 minutes of sunset as proof of roosting then barbastelle roosted within the barn on at least 31 nights of the recording period. Although it is difficult to say how many bats are involved, the following results provide an indication that very small numbers of bats are likely to be involved:

- None of the sound files recorded more than one bat simultaneously;
- On most nights low numbers of passes were recorded before 40 minutes after sunset with a maximum of 52 passes in an hour on 25 August; and
- In an enclosed environment where bats may be flying within the barn for prolonged periods before emergence the detector would record very high levels of activity if several bats were flying within the barn (see *Myotis* below).

If the seasonal patterns are taken into account (see **Figure 3.6**), then barbastelle activity was highest in spring, particularly May, and fell during July and August before a secondary peak at the end of August into September.

Figure 3.6 Seasonal Activity Patterns of Barbastelle in Upper Abbey Barn



Myotis Bats

The seasonal pattern of *Myotis* bat activity in the barn was clearly defined with very little activity between May and August and then 94.6% of all passes (n = 7675) recorded from 23 August until 20 September (see **Figure 3.7**).

The nocturnal activity patterns were similar to those of barbastelle although the early peak was a little later in the night (TC 2-3: 38.2 B/h) and the late peak was earlier in the night (TC 8-10: 30.2 B/h). Natterer's bat (and other *Myotis* species) often emerge late from roosts and return early and this is an expected pattern of behaviour for bats that were roosting in the barn (see **Figure 3.8**).

Figure 3.7 Seasonal Activity Patterns of *Myotis* Bats in Upper Abbey Barn

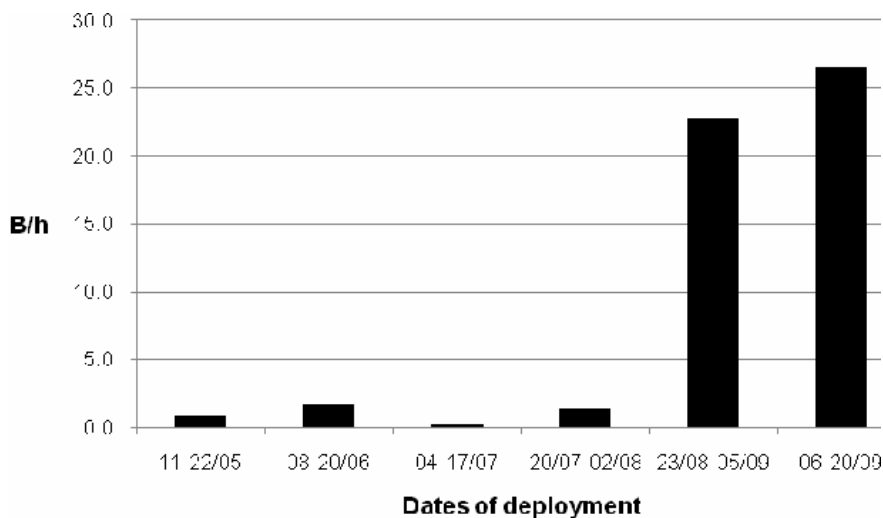
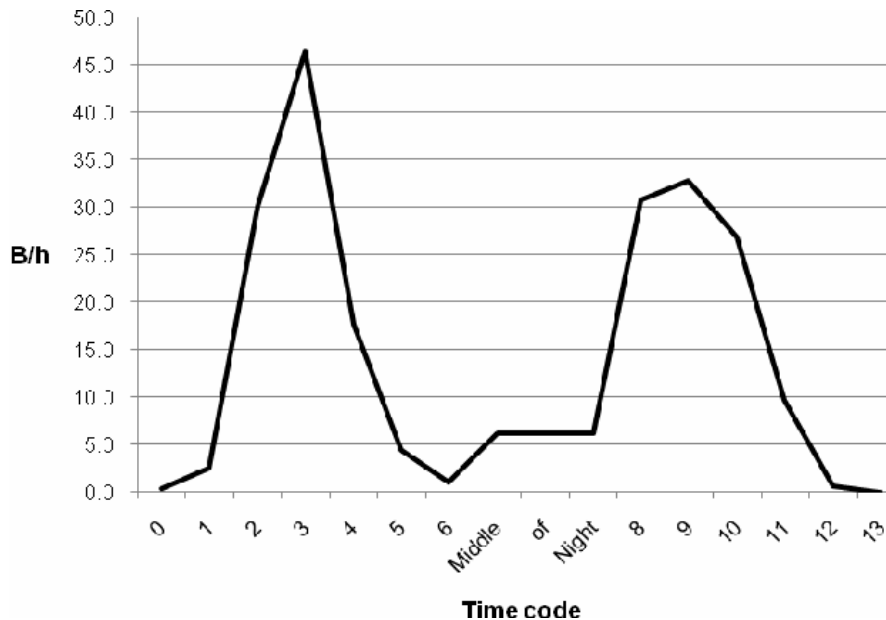


Figure 3.8 Relative activity patterns of *Myotis* bats in relation to sunset and sunrise in Upper Abbey Barn. The 'Middle of Night' label on the X-axis = Time Code 7



3.4.2 Inspection Surveys of other Buildings within the Sizewell Estate

Ash Cottages

This is a 2-storey semi-detached pair of old cottages with brick walls (no cavity) and a pitched, hipped roof covered with pantiles. Inspection of the roof void of no. 5 (the western half of the building) revealed this to be approximately 2.5m high and lined with traditional bitumastic roofing felt. There was a large tear in the felt near the apex. No bats were visible, but a thick layer of several thousand bat droppings, including both old and quite fresh droppings, typical of those produced by brown long-eared bat, covered the loft hatch and several other areas of the floor²³. These findings indicate that the building is still in use as a maternity roost by brown long-eared bats.

Old Abbey Farm

The house on this site is a large, fairly modern bungalow with brick cavity walls and a deep pitched roof covered in pantiles; however, the roof was in good repair with no obvious access points for bats, and the soffits beneath the eaves were close-fitting with no gaps between walls and soffit. Although the owners would not permit internal inspection, they claimed to use the loft regularly and had never seen any signs of bats.

The farm outbuildings comprise a set of large, modern open-fronted barns composed of breezeblock and corrugated metal/asbestos, with very little potential for roosting bats apart from

²³ The tenants had taped around the edges of the loft hatch to prevent droppings falling through into the room below; this took some time to remove, and probably alerted any roosting bats within the loft such that they had time to conceal themselves behind the felt or in the adjacent loft before the surveyor entered.

small gaps formed where the roofs overlap the wall corrugations, possibly providing occasional roosts for single crevice-roosting species.

Emergence surveys during radio-tracking

Barbastelle

On 2 August at least 25 bats were seen emerging from R9. At the same time, two bats were caught and four emerged during trapping at R14. No other tree roosts with breeding females or juvenile bats were known to have tagged bats in at that time: a minimum of 31 barbastelles was therefore recorded on that evening.

The results of the simultaneous emergence surveys of the eight barbastelle roost trees used by breeding female and juvenile bats on 10 August 2011 are presented in **Table 3.11**.

Table 3.11 Results of Emergence Surveys on Eight Barbastelle Roost Trees

Roost number	Number of bats confirmed emerging
R9	1
R13	A single unidentified bat was seen to emerge from an adjacent tree.
R18	3-8. Chattering in roost heard by at least 3 bats. Between 3 and 8 bats emerged but difficult to see due to dense rhododendron.
R17	4-8. Intense bat activity around tree, and it was difficult to estimate how many emerged. A single bat with a working tag was known to be in roost.
R19	1 possible but intense bat activity around tree early in emergence period.
R14	0
R20	0
R21	4-8. Up to three tagged bats were known to be in the roost. Intense bat activity around tree and the cluttered environment made it difficult to view the features and ascertain whether bats had emerged from them.

Between 13 and 27 barbastelles were seen emerging from these trees on 10 August. Roost R21 and R18 were particularly difficult trees to observe with high levels of visual obstructions from surrounding vegetation which could easily have resulted in bats being missed as they emerged from the trees. Similarly, the level of potential for roosting bats in R19 was high into the crown of the tree and the amount of bat activity recorded in the area soon after sunset made it very difficult to see when a bat emerged from the tree. The surveyors at roost R17 experienced similarly high levels of bat activity from pipistrelle bats, barbastelle bats and other species making an emergence count very difficult.

Natterer's Bat

At least 49 Natterer's bats were recorded emerging from numerous locations along the western end of Leiston Abbey Ruins (Roost A) on 31 August, but only 8 bats on 10 August. During the pre-dawn survey on 10 August it was not possible to determine how many bats entered the building as it was too dark to see well when they started to enter.

No bats were seen emerging during surveys of roosts RE and RF, although a tagged bat was known to be in RF and was known to have left the roost during the emergence survey. The non-breeding female bat used a single roost for all eight days, a wooden bat box at the southern end of Kenton Hills (RD). On the final day of radio-tracking (11 August) the bat box was checked and 28 Natterer's bats were observed in the box with juveniles as well as adults present.

3.4.3 Bat Box Survey

Low numbers of soprano pipistrelles were recorded with single adult males in boxes 20, 28, 34 and 37 and a single adult female in Box 20. No Natterer's bats were found although fresh *Myotis* bat droppings were found in Boxes 18, 19 and 21.

4. Discussion of 2011 Results

4.1 Barbastelle

4.1.1 Roost Characteristics

Taking account of the 2010 and 2011 data, there is an apparent preference shown towards roosting behind raised bark, which is similar to that found in other radio-tracking research of this species in Italy (Russo *et al.*, 2004), Germany (Kerth & Melber, 2009), and England (Billington, 2002; Greenaway, 2008; Greenaway & Hill, 2004).

Other research has found that breeding roosts are found in quiet locations well away from the woodland edges and surrounded by dense cover (Russo *et al.*, 2004; Greenaway, 2008) but this was not found to be the case in this study. In 2010, of the 11 tree roosts found, three were on the northern edge of woodland blocks and seven were within 30m of woodland edge. There was also no clear preference in terms of roost feature aspect. Breeding female bats need to remain homoeothermic, i.e. in a state maintaining a high body temperature rather than going into torpor and allowing it to fall, as non-breeding bats do to save energy (Altringham, 2003). This is in order to allow foetal development and later lactation, and it has been suggested that breeding barbastelle bats select warmer areas for roosting to limit the costs of remaining homoeothermic (Russo *et al.*, 2004). At Sizewell, although some roosts with breeding females were on the southern side of tree roosts, several were on the northern and eastern sides of the trees. The orientations and locations of tree roosts in this instance do not appear to show any clear correlation with those in Russo's study.

The roosts were all in high-canopy woodland which is similar to that found in The Mens SAC (Greenaway, 2008). In the majority of cases the shrub layer was dense; comprising stands of bracken, rhododendron or bramble, and R21 was surrounded by dense holly and fallen dead wood.

The roosts in 2011 were generally high up with a single low roost location in the elbow of a bent over limb at approximately 4m agl in a cluttered area with abundant dead wood and dense rhododendron. This is similar to the trend recorded in The Mens SAC where all low roosts were within dense cover (Greenaway, 2008) but differs from the roosts found in June 2010 at Sizewell where low roosts were generally found under closed canopies with patchy to open under-storey.

4.1.2 Movements between Roosts

Barbastelle bats are known to move roosts regularly, even during the period when their young cannot fly (Russo *et al.*, 2004). The mean distance moved between trees by female bats in central Italy ranged between 31m and 626m, with distances decreasing during the main lactating period (Russo *et al.*, 2004). Russo *et al.* also found that barbastelle roosts were most frequently found within unmanaged woodland where dead trees occurred most frequently. Greenaway and Hill (2004) found that the roosts tended to be located within a distinct area which they refer to as a "loyalty area". Loyalty areas will gradually change over time as woodlands develop, and

Greenaway and Hill (2004) suggest that management plans for nursery roosting sites should include areas of five to ten times the area that bats are presently using.

Russo *et al.* (2004) found that the mean distance travelled between consecutive roosts was 89m (range: 0 [sic]-352m) during the late lactation/post-lactation phase. At Sizewell the mean for roost switching of the adult breeding female bats and juvenile bats was 863.6m from 12 combinations of roost switches. The mean distance for juvenile bats was 688.7m (range: 105-1198m) and three of the 12 combinations of roost switches fell within the distance range found by Russo *et al.* (2004). During the pre-lactation period radio-tracking in 2010 the mean roost switch distance was 1203m (range: 488-2006m). This suggests that the population in Sizewell continues to switch roosts on a regular basis but over a larger distance than the cases reported by Russo *et al.* and Greenaway. However, a study in Germany found that female barbastelles could cover large distances of up to 9.0km between consecutive day roost locations (Kerth & Melber, 2009) and it seems likely that there is a great deal of variation between colonies, probably reflecting the relative availability of roost sites.

4.1.3 Colony Structure and Size

Owing to the numerous roost changes, maternity colony sizes are difficult to estimate. In addition, other research has found the existence of sub-groups within a colony (Russo *et al.* 2004) where the number of bats in a maternity colony over seven different counts throughout July and August was 16.7 bats \pm 4.2 (range 12-23 bats). Billington (pers. comm.) counted 26 bats within a single tree roost in Somerset. Greenaway (2008) studied two maternity colonies in Sussex, and estimated counts of at least 64 breeding females in one maternity colony and at least 80 breeding females in the other. These colonies were further divided into sub-groups of 16-25 breeding females (Greenaway, 2008). Records exist of bats changing sub-groups between different years, but never changing nursery colonies (Greenaway, 2004; Greenaway, 2008; Greenaway & Hill, 2004). It is not known whether the Sizewell colony is part of a sub-group, although studies of sub-groups were all carried out in high quality habitats covering larger areas such as the Ahringsbachtal SAC in Germany and The Mens and Ebernoe Common SACs in England and it is possible that the Sizewell colony may be isolated due to the lack of apparently suitable woodland habitats within the surrounding area.

Non-breeding females have been recorded roosting within maternity colonies (Greenaway, 2008), but have also been recorded roosting with small groups of males (Parsons *et al.*, 2001). At Sizewell non-breeding female bats were recorded within the maternity roost trees and appeared to move with other breeding female bats and juvenile bats into different tree roosts.

It is not yet possible to come to any firm conclusions about maternity colony size at Sizewell or whether it is a sub-group within a larger colony. The highest emergence count to date has been of 31 barbastelle bats (from two trees) which included some juvenile bats. However, this may have been only a subgroup of the population in the wider Sizewell area. Barbastelle bats are notoriously adept at evading traps/nets and therefore difficult to catch (Billington, pers. comm.). There are a limited number of ideal trapping locations on the Sizewell Estate on flightlines that are used regularly and where bats find it difficult to evade capture, i.e. on rides where there is dense vegetation both above and to the sides. The use of a Sky net in the coniferous plantation woodland increased trapping success in 2011 and 10 barbastelles were also caught from a single tree roost. Barbastelles were also caught at Fiscal Policy and Turf Pits (as in 2009 and 2010) and Upper Abbey track (in 2011). It is likely that the available trapping locations are not used by all

of the barbastelles and therefore only a proportion of the total barbastelle population has been sampled by trapping.

4.1.4 Foraging Areas and Home Ranges

Adult Females and Juveniles

The main roosting areas for tagged bats in 2011 was centred on Ash Wood and the woodland adjacent to Plantation Cottages, with all breeding female bats recorded in these areas, and tree roosts in Kenton Hills were also used. The majority of bats moved roosts from Ash Wood to the woodland adjacent to Plantation Cottages before moving to Leiston Old Abbey woods, and there was regular movement between the roost in Leiston Old Abbey woods and those at Plantation Cottages.

The 95% MCP analysis showed that the mean MCP area for the breeding female bats tagged in 2011 was 271.6ha (range 128ha – 547.4ha), which is similar to the value for four females radio-tracked in June 2010 (range: 75.7-388.4ha; mean: 221ha). This is at the lower end of the ranges recorded for adult female barbastelles in The Mens (mean: 1,236ha; range 260-2,928ha) and Ebernoe Common (mean: 779.5ha range; 45-2,521ha) (Greenaway, 2008), but was similar to that measured in Germany (mean: 222ha) (Kerth & Melber, 2009) and much higher than that recorded in Switzerland (mean: 8.8ha) (Sierro & Arlettaz, 1997)²⁴.

The 95% kernel analysis showed that the median home range sizes of the seven breeding female bats tracked in 2011 was 303ha (range 202.9ha - 508.1ha) in comparison with the four female bats tracked in 2010 (median: 256ha; range: 101-410ha). The 2011 results are similar to those recorded for 12 female barbastelle bats in Germany, although a wide range of values was recorded (kernel 95%; median: 403ha; range: 125-2551ha) (Hillen *et al.*, 2009), but higher than that from another site in Germany (90% kernel; mean: 108.6ha) (Kerth & Melber, 2009).

At Sizewell the core area size (based on a 95% cluster analysis) of breeding female barbastelle bats ranged from 19.6ha to 226.8ha; with the number of core areas ranging from one to six (see **Figure C26**). Although there is overlap, there does appear to be some partitioning of foraging habitat away from the main roosting area. In comparison, during the 2010 pre-lactation radio-tracking period the 95% cluster analysis produced core areas ranging from 0.25ha to 172ha with the number of core areas ranging between 1 and 4. There was some east-west partitioning of foraging habitat in the belts area north of Grimseys, Leiston Old Abbey woodland and around the Eastbridge Road, Theberton House and the fields north of Leiston Abbey. Areas of overlap occurred around Ash Wood and the field system north of Kenton Hills and around Abbey Farm Track in 2010 with areas of overlap in 2011 being similar but including Goose Hill more in 2011.

The home range analysis results from 2010 have been overlaid onto those recorded in 2011 for adult female barbastelle bats (see **Figures C31-C33**). The 95% MCP analysis shows considerable overlap between the two radio-tracking periods by adult female bats, particularly in the areas of Ash Wood, Upper Abbey and Leiston Old Abbey, Goose Hill and Kenton Hills. **Figure C32** illustrates the 95% cluster analysis for the four breeding female bats in 2010 and the eight adult females in 2011. The figure shows that while there appears to be overlap in key

²⁴Note the MCP% analysis is not given in Greenaway 2008 or Sierro and Arlettaz 1997 but given as 100% MCP in Kerth and Melber 2009).

areas, namely Ash Wood, Upper Abbey and Leiston Old Abbey, Goose Hill and the Kenton Hills area, there does appear to be some partitioning whether by season or by bat with some distinct areas used in the north-east around Eastbridge, over Sizewell Belts and to the west and south west towards the sewage works and Greenhouse Plantation.

The mean MCP area of the juvenile bats is smaller than that of the adult female bats at 184.9ha (range: 11.2-352.8ha). If the home range of bats 12 and 19 (see Section 3.1.4) is excluded, the mean home range size increases to 263.8ha, which is comparable to that of the adult female bats. The 95% kernel analysis also revealed a similar home range size for the juvenile bats as for the adult females (median: 199.3ha; range: 20.4-352.8ha). The kernel sizes of bats 5 (239.2ha), 14 (199.3ha) and 18 (352.8ha) are similar to those of the breeding female bats.

The 95% cluster analysis, however, results in a mean of 76.4ha while the number of core areas ranges from 2 to 4 and these are generally smaller than those of the breeding female bats. This is similar to the findings of Greenaway and Hill (2004) which suggested that the availability of productive foraging habitat close to the roost is important to the survival of juvenile bats. At Ebernoe Common SAC, Greenaway (2004) observed that adult barbastelles allowed juvenile bats use patches of high quality foraging habitat close to the roost exclusively. There was also one core foraging zone close to the roosts that would be shared between adults and juveniles, with juveniles initially flying near the roost and then following their mothers towards their foraging grounds. The behaviour of juvenile bats at Sizewell suggests that birth dates may have been spread quite widely, with older juveniles foraging further afield and younger juveniles remaining closer to the roost area. The data from Sizewell indicate that the core adult female/juvenile foraging zone incorporates Goose Hill, Kenton Hills, Ash Wood, Leiston Old Abbey woods, Black Walks, the woodland around Plantation Cottages (north as well as east and west) and east to The Grove, with juvenile foraging zones close to roosts at Ash Wood and Plantation Cottages.

Research in Sussex found that breeding females dispersed from the roost area along established flight lines to foraging areas often several kilometres away. The female would repeatedly use the same flight line with juveniles following their mothers along the flight lines to become familiar with the routes and foraging zones (Greenaway, 2004). The flight lines usually ended in a section used by a single bat to access the most distant foraging area (Greenaway, 2004). Barbastelle bats radio-tracked from The Mens Woodland SAC ranged widely (range: 2.64-11.98km; mean: 7.1km), as did those from Ebernoe Common SAC (range: 1.17-10.46; mean: 5.1) (Greenaway, 2008). The average flight distances for pregnant or lactating females at the same locations were 7.67km and 5.09km respectively (Greenaway, 2008). From Paston Barn near Cromer (Norfolk) female barbastelles flew a maximum of 2.75km to their foraging site, while males were tracked 4.75km (Parsons *et al.*, undated). At Sizewell the maximum distance recorded from a roost tree was 3.08km for bat 13, a breeding female, while bat 8 was recorded at least 2.9km north into Minsmere and three other bats ranged over 2km. The mean furthest distance travelled for the adult female bats was 2.3km, which is considerably smaller than the mean recorded at The Mens and Ebernoe Common. The mean furthest distance travelled by juvenile bats was 1.8km with a maximum distance of 2.8km. In addition to the shorter distances travelled, there also appears to be some difference at Sizewell to that recorded at Sussex regarding the flight lines. Whilst there do appear to be some well used flight lines around the core area, there do not appear to be any repeatedly used dispersal corridors to foraging areas further away from the roost areas as described in Sussex. The areas of woodland used for roosts are more fragmented than those in Sussex and there are some strong flight lines linking roosts to core foraging areas, for example between Ash Wood to Hilltop Covert via Stonewall Belt and to

Goose Hill via the new plantation woodland to the west. To the west of Ash Wood the habitats are open until the Upper Abbey track is reached and bats were regularly recorded flying in this direction over the arable fields.

The 95% MCP home ranges for the breeding female barbastelles have been overlaid and the area of overlap has been measured. The area where the MCP for all seven breeding female bats overlapped covers an area of 52.5ha (see **Figure C34**) and includes Ash Wood, Black Walks and Hilltop Covert. However, the difference between the area over which three and five bats overlap is small, and the core area may be taken as at least the area of overlap for three bats overlapping, which extends to 249ha. This core area is used by breeding females and juveniles, and may bear comparison with the large productive zone referred to in Greenaway (2004). Although the Sussex bats appeared to disperse from this core large productive zone into partitioned areas used by individual females, it is less apparent that this occurs at Sizewell, where there appears to be a large degree of overlap in foraging habitats. The core area appears to extend south from the main maternity roosting areas of Ash Wood and woodland adjacent to Plantation Cottages, and the bats do not appear to have a number of foraging areas on particular flight routes, such as may be used by a female to collect the juvenile on her return path as suggested in Sussex.

A similar analysis of the 95% MCP home ranges for the juvenile bats has also been undertaken (**Table 4.1** and **Figure C35**).

Table 4.1 Areas of Overlapping Ranges of Juvenile MCP's

No. of bats with overlapping home ranges	MCP overlap area (ha)
5	10.3
4	77.7
3	144.9
2	259.8

The main area of overlap for juveniles occurs between the woodland adjacent to Plantation Cottages south to Ash Wood through Black Walks and south to Upper Abbey. This area then extends out towards Goose Hill to the south-east. When comparing the areas of overlap between breeding female bats and juvenile bats, the area of overlap for at least two juvenile bats (259.8ha) and at least three female bats (249.4ha) is similar, with 86% overlap between these two areas. It is considered that the minimum size for the core foraging zone for the colony at Sizewell based on the data collected so far is best represented by the area shown in **Figure C36**.

Adult Males

During the summer season Greenaway (2004) notes that male bats tend to be active for fairly short periods of the night and appear to forage entirely in woodlands within 1km of their roost site. Although the only tagged male (bat 7) was not continuously followed, it was recorded frequently. The furthest known distance flown from its roost was 2.77km from the Hill Farm roost (R22) to Grimseys Wood. The two core areas in which it was recorded were the Sizewell Belts area and the area west of Old Abbey Farm; with occasional records of the bat further north

in Eastbridge and south at the Sewage Works. This partly concurs with the findings of Greenaway (2004) that the foraging areas used by the male may be in suboptimal habitats when compared to those used by the females; however, bat 7 also flew in some areas of habitat used by the females, including the Belts and Eastbridge. A single male recorded at Ebernoe in 2008 flew a maximum distance of 1.17km and had an MCP of 45.11ha in comparison to the male at Sizewell with an MCP of 490.3ha. A recently published study by Hillen *et al.* (2010) also found a degree of sexual segregation within the species. Radio-tracked males used habitat patches, particularly forest edges and open habitats, sometimes close to the maternity colony foraging areas. Females were found to prefer deciduous forest and linear elements within the forest.

Habitat Use

At Sizewell, barbastelles have been recorded using a wide variety of habitats for foraging and commuting, and the data collected between 2007 and 2011 show that barbastelles use almost all the habitat available within the Sizewell Estate.

In August 2011, radio-tracking data confirmed that the area occupied by the maternity colony was similar to that occupied in 2010. However, potentially significant roosts were discovered in new areas further to the north around Plantation Cottages and also near Leiston Old Abbey. The roost areas to the north help explain the high levels of barbastelle activity recorded from static bat detectors at Black Walks in 2010 and 2011.

The data from 2011 add to our knowledge of habitat use by this species at Sizewell, and the radio-tracking data from summer 2011 reinforce data from static bat detector surveys in 2010 and 2011 in identifying key summer foraging habitats in addition to those identified during radio-tracking in June 2010. In summary the data collected so far indicate that the following habitats are of key importance for foraging and commuting bats:

- Mature broad-leaved woodland, in particular at Ash Wood, near Plantation Cottages, Leiston Old Abbey, Fiscal Policy and The Grove;
- Heathland/pasture with patchy areas of bracken *Pteridium aquilinum* and scrub at Black Walks and on the eastern edge of Goose Hill and The Grove;
- Hedgerows and field boundaries within arable and pasture areas, for example around Ash Wood, Plantation Cottages and Leiston Old Abbey;
- Pine plantation woodland in Kenton Hills/ Nursery Covert and particularly Goose Hill;
- Grazing marsh within the Sizewell Belts, around Eastbridge and to the east of Goose Hill and The Grove;
- Wet woodland (e.g. detector location P2 2a);
- Lines of mature trees that offer shelter for foraging and commuting, e.g. along Upper Abbey track, north of Ash Wood and Stonewall Belt; and
- Parkland around Theberton (in 2010).

The Sizewell Estate provides a rich habitat for this species due to the varied foraging opportunities and habitats available, in addition to numerous roosting opportunities. The apparent core foraging area encompasses most of these habitats and some of the areas described

here offer peripheral foraging habitats that are used less frequently but may provide essential additional resources to support individual bats from the colony. The overall impression of barbastelle activity at Sizewell is that bats use all available habitats and do not apparently travel very far from roosts to foraging areas.

4.1.5 Natterer's Bat

Research has found that nursery colonies of Natterer's use a complex of roost sites. One study found that the day roosts of a colony were contained within an area of 2km² (400ha) within the colony's home range, with a density of up to 15 roosts per km² (Smith & Racey, 2002). The published range of foraging areas for Natterer's bats is 170-600 (mean: 215ha) (Dietz *et al.*, 2009). Home ranges recorded at Sizewell appear to be smaller than this, although not as much tracking effort was expended on this species as on barbastelle and the number of locational fixes recorded for bats was much lower than in the research study. The species typically forages within 4km from the roost, although research in Germany found a preference for foraging areas within 1.5km of the roost site, each with core areas of 2-20ha within a home range of 100-600ha (Boye & Dietz, 2005). Foraging areas may be up to 3km from the roost site, but in late summer and autumn they were found to be rarely more than 600m away from the roost (Boye and Dietz, 2005). The maximum distance from their respective roost sites recorded for the four bats tracked at Sizewell ranged between 1,194m and 1,675m (see **Figure C37**).

Semi-natural broad-leaved woodland and open water sheltered by tree cover are considered to be the prime foraging habitats for Natterer's bat, although grassland is also well used for foraging (Smith & Racey, 2002). The core areas used at Sizewell were the woodland of Fiscal Policy and the grassland and ditch network with associated hedgerows and tree lines around the sewage works area to the south and west of Lover's Lane for bats 1 and 2, and Goose Hill/The Grove and adjacent areas for bats 21 and 22.

4.1.6 Brown Long-eared Bat

Brown long-eared bats tend to stay relatively close to their roosts, most frequently within 0.5km, often to 1.5km and generally not further than 3km (Altringham, 2003). Dietz *et al.* (2009) state that summer foraging grounds tend to be within 2.2km of the roost, of 4-11ha in size with the core foraging area smaller than 1ha. The bat tracked in this study foraged up to 2.6km from the roost site to the northern end of Goose Hill and 1.5km from the roost site to the Sandy Lane area and occupied a much larger home range than was found by Dietz *et al.*

4.1.7 Surveys of Upper Abbey Barn

The results confirm that the barn has been a bat roost for many years and is used by four main species: common and soprano pipistrelle, barbastelle and Natterer's bat.

The number of fresh droppings suggests that low numbers of bats shelter in the barn. Alan Miller (SWT) has recorded Natterer's bats roosting in mortise joints in the barn for several years and droppings found in the barn and previous observations suggest that Natterer's bats are probably the species involved. The droppings found were not fresh and were unlikely to be from bats roosting in 2011. However, the results from the static detector survey suggests that, in 2011 at least, Natterer's bats used Upper Abbey Barn in the late summer/autumn and may only have been roosting in the barn during late August and September for the period of static bat detector deployment (May to September). On a previous inspection survey in spring 2009 old droppings were again found and may have again originated from the previous year.

The high level of activity in September suggests that this is likely to be a mating roost for *Myotis* bats. This species, as most UK bat species do, mates in the autumn and particularly in September. Mating usually takes place either at swarming sites at caves and other underground features where bats will migrate from considerable distances to gather (Rivers *et al.*, 2006) or at small autumn roosts where females will gather with males (often small numbers of each) to mate (Park *et al.*, 1998). Published and anecdotal information from a number of sources indicate that Natterer's bat mating roosts may contain 5-30 bats, although it is not possible to estimate the size of the roost at Upper Abbey Barn from detector records alone. Although Alan Miller (see above) has suggested that there is a maternity colony of Natterer's bat in Upper Abbey Barn, this does not seem to have been the case in 2011.

For barbastelle, it is difficult to draw conclusions as to the likely status of any roosts. The peak in activity was in May-June and August-September and there are a number of possibilities including spring use by a maternity group during poor weather, a mating roost in the late summer period, males and non-breeding females roosting singly within the barn and also bats visiting just to forage (possibly in poor weather).

5. Evaluation

Overall, the number and diversity of bats caught during radio-tracking and recorded during activity surveys in 2011 was similar to 2010 and the area as a whole appears to be important for bats. The results of surveys largely reinforce the evaluation from the previous years' baseline survey, although the radio-tracking survey (in particular) in 2011 added considerable additional baseline information for barbastelle and Natterer's bat.

The evaluation provided below is presented for barbastelle and then for all other species of bats separately. This draws together the results from all bat surveys undertaken at Sizewell during 2007-2011 including activity surveys (walked transects and static bat detector surveys) and the radio-tracking surveys, with further information, where relevant, from any roost surveys. In this section, barbastelle bats remain the focus for discussion due to their high conservation status and the presence of a breeding colony on the site. The evaluation places a value on the identified ecological feature in geographic terms, as described in the Institute of Ecology and Environmental Management's guidelines relating to ecological impact assessment (see Section 2.8 and IEEM, 2006). This section does not attempt to give a value to particular areas of the site, and concentrates on assessing the value of the populations of each species of bat at Sizewell.

5.1 Barbastelle

The surveys undertaken in 2011 have confirmed the continued use throughout the breeding season of the Sizewell estate by breeding barbastelle bats. Radio-tracking surveys in 2011 have shown that there is an apparent core foraging zone used by juvenile and breeding female bats that is described in Section 4.1.1 and illustrated in **Figure C36**. Outside of this core foraging zone there is a degree of overlap of foraging by both breeding female and juvenile barbastelles into various peripheral areas. The results of the radio-tracking surveys are confirmed and reinforced by the results of the other surveys carried out on site in 2011; particularly the static bat detector surveys (see Section 3.3.3). The 2010 and 2011 surveys have served to confirm the fidelity of the colony to the Sizewell Estate, and its use of trees within the Estate as nursery roosts. The reliance of the colony on the Estate is strongly indicated by the number of key roost trees within it and by the fact that the majority of radio-tracked bats used it as their core foraging area.

The value of the site should be considered as a whole to the relevant population. The precise evaluation of this resource is subject to some uncertainty for several reasons:

- The reference population size (i.e. Suffolk or UK) is unclear as there is no published estimate for the Suffolk population, and UK population estimates are based on very limited data (see **Appendix A** and Section 1.6);
- The size of the population at Sizewell is not known for certain: 31 (including juveniles) is the minimum size of the maternity colony recorded from emergence counts (from two trees on 2 August). Owing to the frequent roost changes and the existence of sub-groups within a colony, maternity colony numbers are difficult to estimate (as discussed in Greenaway, 2008) and very little information exists to

compare against. It is currently not possible to make a reliable population estimate from the limited data that have been collected; and

- It is not known for certain whether there are any hibernation roosts for barbastelle within the Sizewell Estate. Given that this species frequently roosts in trees and outbuildings during the hibernation period, it is likely that at least a proportion of the summer population also hibernate on the site.

Despite the uncertainties associated with evaluating the barbastelle resource associated with the site, barbastelle is considered to be rare in the UK, with a low number of maternity colonies discovered to date (see Section 2.6). The UK conservation status of barbastelle is therefore such that any breeding colony of this species would be regarded as of at least **national** importance.

5.2 Natterer's Bat

Four Natterer's bat roosts have been confirmed within or near to the Sizewell Estate through the radio-tracking surveys, one in Leiston Abbey Ruins, one in a bat box at the south of Kenton Hills, and two in trees in The Grove and Sandpytle Plantation. In addition, the known roost of this species in Upper Abbey Barn was confirmed as a likely mating roost from static bat detector surveys in 2011. The home ranges of two bats roosting at Leiston Abbey and the two bats using the other roosts (in Kenton Hills and The Grove) did not overlap during radio-tracking surveys. The size of the roost in the ruins was found to decrease from 49 on 31 July to eight on 10 August, which may indicate that the colony switches roost locations although it could also have been dispersing. It is possible that whilst the home ranges were different the bats were part of the same larger colony with a number of roosts in and around the estate.

This species is reasonably widespread in Suffolk (see **Appendix A**) and is listed as fairly common in the UK by Battersby (2005) with an estimated English population of 70,000 individuals. Recent monitoring data from hibernation counts has indicated that the UK population may be increasing but there are insufficient data at present to be sure of this trend (BCT, 2010). The presence of breeding colonies and at least one mating roost means that the site resource is likely to be valued as of at least **district** importance.

5.3 Daubenton's Bat

The precise evaluation of this resource is subject to some uncertainty given the lack of data on the species. Single bats were trapped in both 2009 and 2010 although trapping effort in 2011 produced no captures. They have also been observed feeding over ditches in the northern area of the Sizewell Belts and are likely to be reasonably common across the site and mainly associated with wetland habitats. Daubenton's bats are widespread and locally common in Suffolk and are thought to be common throughout much of the UK (Battersby, 2005) with probably largely stable populations (BCT, 2010). The value of the Daubenton's population is thus likely to be of **local** importance.

5.4 Noctule

Noctule bats are recorded regularly at Sizewell and appear to prefer open areas, particularly over grazing marsh, for foraging. Individual noctules use bat boxes in Kenton Hills for summer

and winter roosting, but they are not likely to be roosting on the site in large numbers or for breeding, given the low activity levels recorded for this species and the fact that all three noctules recorded in the hand (two in The Grove during trapping, and one in a bat box) were male. The species is thought to be widespread in Suffolk, albeit present in low numbers, and generally uncommon in the UK (Battersby, 2005). The noctule population using the site is therefore likely to be of **local** importance.

5.5 Leisler's Bat

The population of Leisler's bat on the site does not appear to be large, with relatively low activity levels recorded from most detectors. This combined with the lack of any records soon after sunset or before sunrise, and the fact that in the UK maternity colonies tend to occur in buildings rather than trees, suggests that the Sizewell Estate does not support any major roosts of this species. However, there are very few known Leisler's roosts in Suffolk (three to date, all in the NW of the county) and they have not been recorded in this general area before (see 2009 report). The English population is thought to be around 9,750 individuals and the species is thought to be scarce in the UK (Battersby, 2005). Despite the apparently low numbers of bats present, but taking account of its rarity in this area, the Leisler's bat population is likely to be of at least **district** importance.

5.6 Common Pipistrelle

Common pipistrelle is widespread and common in Suffolk and is the most abundant species of bat in the UK (Battersby, 2005), although they were not recorded as frequently as soprano pipistrelle within the Sizewell Estate in 2010. Although no large roosts have been found of this species, they have been seen emerging from Upper Abbey Barn in small numbers and may roost in other buildings in the area as well as in trees and the bat boxes, where single bats were found during surveys in 2010. A large number of pregnant females were caught in 2010 and there may be undiscovered maternity roosts within the site given the very early capture (often around sunset) of some breeding females. However, larger roosts of this species are usually found in buildings, rather than trees, and these are likely to be located off-site. The population at Sizewell is likely to be of **local** importance.

5.7 Soprano Pipistrelle

This is the most frequently recorded species of bat at Sizewell. There are known roosts of soprano pipistrelle in Upper Abbey Barn and the bat boxes in Kenton Hills (maternity colony of around 70 individuals). A large number of pregnant female bats of this species were caught and there are likely to be further undiscovered roosts within the Estate. The resource of soprano pipistrelle is likely to be of **local** or possibly **district** importance, due to the large numbers of this species present on site and the importance of the site for breeding females.

5.8 Nathusius' Pipistrelle

Maps of UK records in Russ *et al.* (2001) show that this species has been recorded prior to 1998 in Suffolk and that three records have been collected since 1998 on a reliable online national

database²⁵, collated by Jon Russ from Aberdeen University. These records include one from close to the site at Sizewell Wents (TM468628) in July 2007. The status of the species in the UK is unclear although it has been afforded the status of a migrant winter visitor (Speakman *et al.*, 1991) and it is listed as rare with the mainland British population estimated to be 4,000 individuals (Battersby, 2005). There are only three known maternity colonies in Great Britain, all in eastern England²⁶. In addition the NBMP has recently begun a Nathusius' pipistrelle survey which was piloted in 2009 and continued in 2010. Results should be published in 2011 and may add a significant number of records to the UK (and Suffolk) database.

The relatively high activity levels of this species recorded at migration times suggests that Nathusius' pipistrelle is fairly common and widespread at Sizewell during April/May and August/September (and potentially October although surveys have not been carried out at this time) and that the migratory population may be of importance, given the apparently low numbers of records from Suffolk and elsewhere in the UK, although it is possible that this species is significantly under-recorded and/or expanding its range into the UK. The presence of this species over the Sizewell Belts during the summer implies that there may be a breeding colony nearby. The recording of calls close to sunset may indicate areas where bats may be roosting, but those recorded at Sizewell tell us little about the potential location of any roosts due to the scattered distribution of these records (see Section 3.3.3). No bats of this species were trapped despite targeted attempts in 2011.

The Nathusius' pipistrelle population should be split into two for the purposes of evaluation: a migratory population (which passes through the area, and possibly hibernates) and a potential breeding population, due to the difference in value that these two populations may have. There appears to be a large migratory population present in the spring and autumn which currently appears to be of **district** or **county** importance due to the apparent scarcity of records within Suffolk. If there is a breeding population within the Sizewell Estate the population would be of at least **regional** importance, given the scarcity of colonies of this species in the UK.

5.9 Serotine

The population of serotine using the site does not appear to be large, with relatively low activity levels recorded from a few static detectors. However, in 2011 large numbers of this species were recorded in Goose Hill from June to September with nine bats trapped (largely near Goose Hill) during the radio-tracking in August. It is possible that this activity was atypical or that surveys in previous years have not detected the importance of this area for this species.

The lack of records close to sunset or sunrise suggests that the Sizewell Estate does not support any large roosts of this species. Moreover, serotine bats prefer to roost in buildings rather than trees and there is no evidence at present of any roosts in buildings that have been surveyed. However, there are a number of un-surveyed buildings within the potential range of serotines using the site that may have the potential to support this species. Serotines in England have been found to travel an average of 6.5km from roosts to foraging areas (Catto *et al.* 1996) and an average of 8km and up to 41km in another study (Robinson & Stebbings, 1997). There are at

²⁵ <http://www.nathusius.org.uk/Distribution.htm>.

²⁶ The roosts were found in Norfolk, Lincolnshire and Rutland. Of these the former has not been re-checked and the latter two were present for one year only.

least 35 known roosts of this species in the county and they are clearly a widespread if uncommon species in the county (see **Appendix A**). The population at Sizewell is therefore likely to be of **local** but possibly up to **district** importance given the numbers recorded in Goose Hill in summer 2011.

5.10 Brown Long-eared Bat

At least two maternity colonies of brown long-eared bats are located within the Sizewell Estate, at the Wildlife Trust workshop at Upper Abbey and in Ash Cottage (as confirmed during the 2011 inspection survey). Another maternity colony was found in August 2011 in a house near the Cliff House Caravan Park, just south of the Estate, through radio-tracking of a breeding female. The species is likely to be relatively common and found in most areas of the site, based on trapping results and the widespread distribution of static detectors that recorded them. The population at Sizewell is likely to be of **local** importance given the species' status in Suffolk as common and widespread (see **Appendix A**).

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Appendix A

Policy, Legislation and Status of Bats in Suffolk

Legislation and Policy Guidance

Biodiversity Action Plan

Seventeen²⁷ species of bat are known to be resident in the UK, seven of which are on the list of priority species²⁸ in the UK Biodiversity Action Plan (UK BAP), adopted by the Government in 2007. Species included on this list have been identified by the UK Government as needing special conservation effort because of their rarity and/or decline in numbers over recent decades. Species Action Plans (SAPs) have been developed to identify conservation priorities, propose action, and set targets to try and maintain and restore populations.

The process of identifying BAP priorities in Suffolk began in 1997, and an initial plan (Tranche 1) was produced in 1998. Priority species included the common pipistrelle bat. Tranche 2, published in 2000, was withdrawn and a new list was published in June 2010, with a new combined BAP for all bat species due for completion in autumn 2010. Although this had not been issued at the time of writing some information from the draft BAP for bats is included in **Table D1** below. The latest list includes the following bat species: barbastelle, brown long-eared bat, noctule, soprano pipistrelle and lesser horseshoe bat.

Protective Legislation relating to Bats

All bat species and their roosts are protected in the UK under The Conservation of Habitats and Species Regulations 2010 which implements the EC Directive 92/43/EEC (the Habitats Directive). In addition, the lesser horseshoe bat *Rhinolophus hipposideros*, greater horseshoe bat *Rhinolophus ferrumequinum*, Bechstein's bat *Myotis bechsteinii* and barbastelle are listed in Annex II of the Habitats Directive, which requires sites to be designated by member states for their protection.

All bat species and their roosts are also protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), and under the Countryside and Rights of Way Act 2000. Taken together, these Acts and Regulations make it illegal to:

- Intentionally or deliberately kill, injure or capture bats;
- Deliberately or recklessly disturb bats;
- Damage, destroy or obstruct access to bat roosts;
- Possess or transport a bat or any part of a bat, unless acquired legally; and

²⁷ This does not include greater mouse-eared bat (*Myotis myotis*), which is considered resident by some, but only a single individual has been recorded in recent years after the species was officially declared extinct in the UK.

²⁸ Priority bat species in the UK BAP: barbastelle, Bechstein's bat *Myotis bechsteinii*, noctule, soprano pipistrelle, brown long-eared bat, greater horseshoe bat *Rhinolophus ferrumequinum* and lesser horseshoe bat *Rhinolophus hipposideros*.

- Sell, barter or exchange bats or parts of bats.

The Natural Environment and Rural Communities Act 2006 (NERC Act) states, in Section 40(1), that “*every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity*”. Section 40(3) of the NERC Act 2006 goes on to state that “*conserving biodiversity includes, in relation to a living organism or type of habitat, restoring or enhancing a population or habitat*”.

Section 41(1) of the NERC Act 2006 states that “*the Secretary of State must, as respects England, publish a list of the living organisms and types of habitat which in the Secretary of State’s opinion are of principal importance for the purpose of conserving biodiversity*”. All seven species of bats that are priority species in the UK Biodiversity Action Plan (see Section 2.4.1) are also considered Species of Principal Importance for the Conservation of Biodiversity under Section 41 of the NERC Act.

In paragraph 16 of Planning Policy Statement 9, the Government indicates that local authorities should take steps to further the conservation of species of principal importance for the conservation of biodiversity in England and should ensure that that these species and their habitats are protected from adverse effects of development, where appropriate, by using planning conditions or obligations.

Developments that compromise the protection afforded to bats under the provisions of The Conservation of Habitats and Species Regulations 2010 almost invariably require a licence from Natural England. Three tests must be satisfied before a licence to permit otherwise prohibited acts can be issued:

- Regulation 53(2) (e) states that licences may be granted by Natural England to ‘preserve public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment’;
- Regulation 53(9) (a) states that a licence may not be granted unless Natural England is satisfied ‘that there is no satisfactory alternative’; and
- Regulation 53(9) (b) states that a licence cannot be issued unless Natural England is satisfied that the action proposed ‘will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range’.

In conclusion, a licence permits otherwise unlawful actions and it is the responsibility of the developer, or their appointed advisor, to decide whether a licence is required for work that has the potential to affect bat populations. It is important that the developer carries out a thorough survey and accurate assessment to help avoid committing offences. It is also the responsibility of the developer to design and implement a mitigation scheme that meets the licensing requirements and ensures, as far as possible, the long-term maintenance of any bat population affected. Licence applications (under Regulation 53(2) (e) of the Habitats Regulations) will be determined by Natural England.

Status of Bats in Suffolk

Of the seventeen species of bat that are known to be resident in the UK, the species listed in **Table A1** are known to occur in Suffolk.

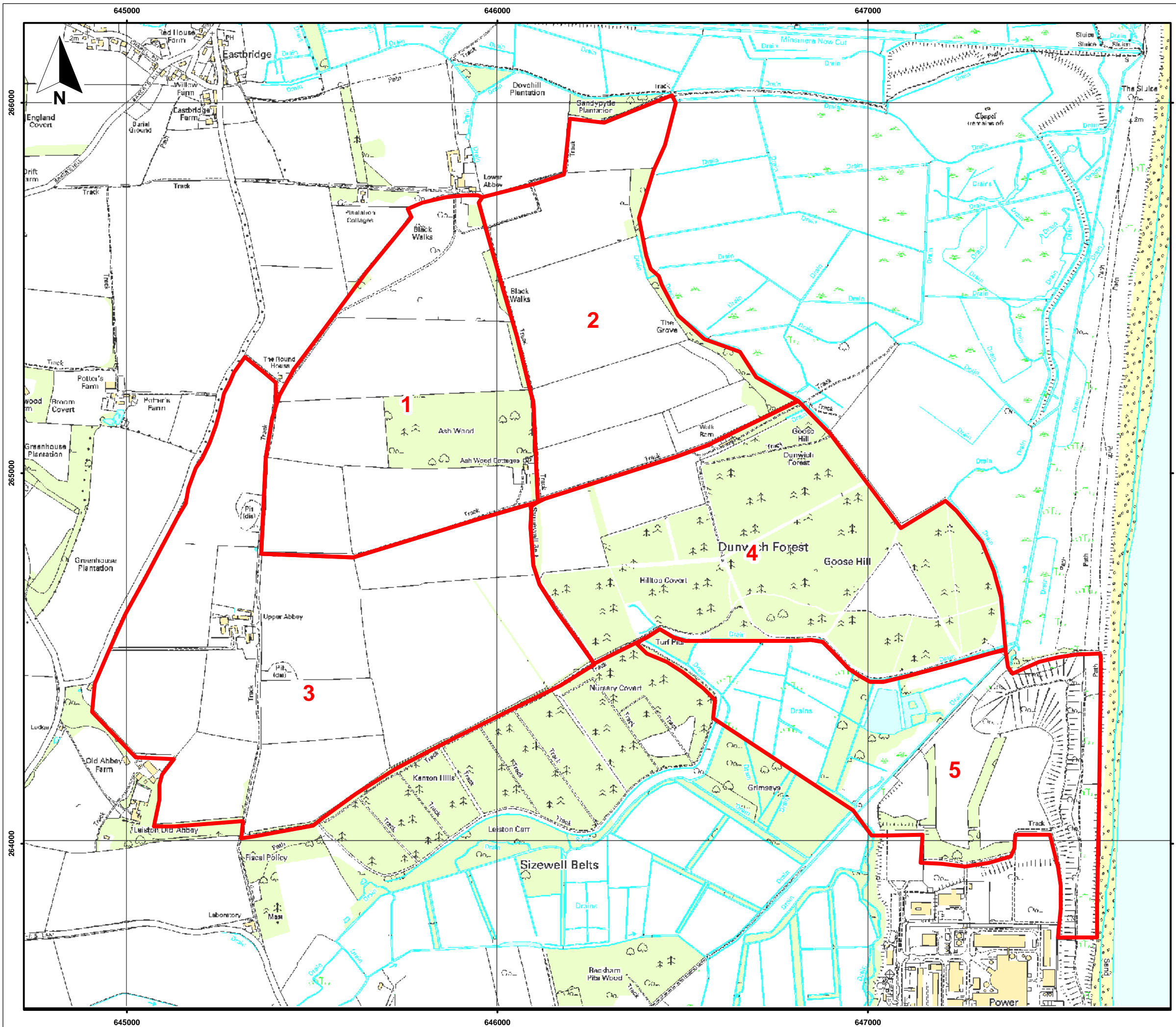
Table A1 Status of Bat Species in Suffolk²⁹

Species	No. of occupied 1 km squares	Range & abundance	Notes	Source
Noctule	86	Uncommon but widespread		Suffolk BAP
Leisler's bat	14	Rare and locally distributed	Only three nursery colonies are known in the county. Appears to be confined to the north-west of Suffolk.	Suffolk BAP Suffolk Bat Group
Serotine	109	Uncommon but widespread	There are approximately 45 known colonies in Suffolk.	Suffolk BAP Suffolk Bat Group
Nathusius' pipistrelle	2	Rare and locally distributed	There are only a few records from Suffolk currently; more may come to light from a new BCT survey, initial results of which are due to be published in February 2010.	Suffolk BAP Suffolk Bat Group
Soprano pipistrelle	74	Uncommon but widespread		Suffolk BAP
Common pipistrelle	682	Common and widespread		Suffolk BAP
Lesser horseshoe bat	1	Rare and very local	A single bat (presumed to be the same individual) has been recorded at a hibernation site in most winters between 1996 and at least 2008.	Suffolk BAP Suffolk Bat Group
Natterer's bat	131	Uncommon but widespread		Suffolk BAP
Daubenton's bat	50	Locally common and widespread		Suffolk BAP
Whiskered/Brandt's/Alcathoe ³⁰ whiskered bat	?	Rare and very local	Until January 2000 all records were from two hibernation sites, and refer to single animals. A breeding roost has yet to be discovered in the county.	Suffolk Bat Group
Brown-long eared bat	624	Common and widespread		Suffolk BAP
Barbastelle	40	Uncommon but widespread		Suffolk BAP

²⁹ Information provided from the Suffolk BAP is draft and unpublished at the time of writing (13/12/2011).

³⁰ Whiskered and Brandt's bats are cryptic species (i.e. very similar to each other and therefore difficult to distinguish), so all previous hibernation site records would have been recorded as "whiskered/Brandt's". However, a third cryptic species, Alcathoe whiskered bat, was confirmed to occur in the UK in 2010, and is now thought to have been resident and probably widespread here for some time. Hibernation records could therefore represent any of these three.

Appendix B Survey Area



Key:

- 1 Area 1
- 2 Area 2
- 3 Area 3
- 4 Area 4
- 5 Area 5

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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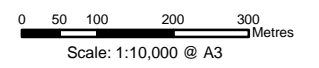
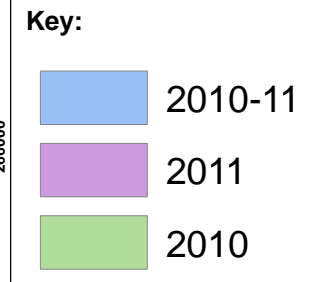
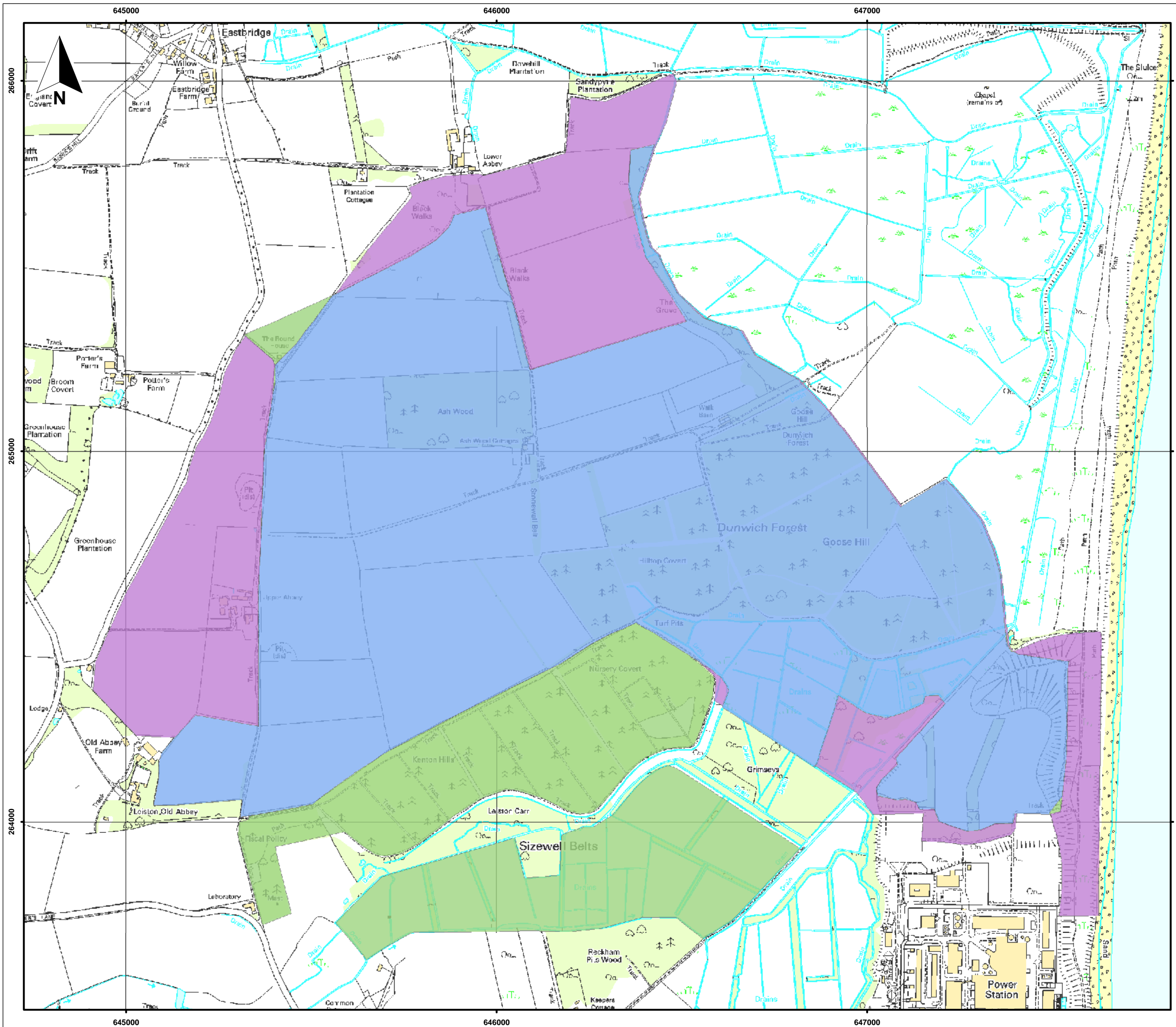
Sizewell Bat Report 2011

Figure B1
Survey areas for walked transect and static bat detector surveys

January 2011
28130-A241.mxd tugwc



Based upon the Ordnance Survey Map with the permission of the Controller of Her Majesty's Stationery Office. © Crown Copyright. 10001776



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Sizewell Bat Report 2011

Figure B2
Difference between the extent
of the overall survey area
used in 2010 and 2011

January 2011
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Appendix C

Radio-tracking Results

Table C1 Details of all Bats trapped³¹

Bat No.	Species	Ring No.	Sex	Breeding status	Forearm length (mm)	Weight (g)	Comments	Tag weight (g)	% of body weight
1	Natterer's bat	-	Female	NB	41.1	7.8	-	0.47	6.0
2	Natterer's bat	-	Female	PL	39.5	8.7	-	0.47	5.4
3	Barbastelle	T8852	Female	NB	39.6	8.7	Medium ET, fused joints, patchy wings	0.47	5.4
4	BLE	-	Female	PL	39.7	9.1	-	0.47	5.2
5	Barbastelle	T8854	Male	Juvenile	38.2	7.1	No ET	0.35	4.9
6	Barbastelle	T8853	Female	PL	38.9	10.4	-	0.47	4.5
7	Barbastelle	T8855	Male	NB	39.8	9.2	Medium ET	0.47	5.1
8	Barbastelle	T8856	Female	PL	40.4	9.9	Small ET	0.47	4.7
9	Barbastelle	T8859	Female	PL	37.9	11.3	Medium ET	0.47	4.2
10	Barbastelle	-	Male	Juvenile	38.5	5.9	Medium ET	0.28	4.7
11	Barbastelle	T8860	Female	PL	39.3	9.4	Very small ET	0.47	5.0

³¹ M= male, F = female, NB = non-breeding, PL = post lactating, L = lactating, TS = testes swollen (i.e. male in breeding condition), HT = harp trap, MN = mist net, Sky = sky net, R = tree roost, HT (L)=acoustic lure used at trap playing 'barbastelle 1' social call on Sussex Autobat.



Bat No.	Species	Ring No.	Sex	Breeding status	Forearm length (mm)	Weight (g)	Comments	Tag weight (g)	% of body weight
12	Barbastelle	T8864	Male	Juvenile	36.9	6.6	Medium ET	0.35	5.3
13	Barbastelle	T8861	Female	PL	39.5	9.3	Large ET	0.47	5.1
14	Barbastelle	T8865	Male	Juvenile	36.5	6.9	Large ET	0.35	5.1
15	Barbastelle	T8866	Male	Juvenile	37.2	7.1	Very small ET	0.35	4.9
16	Barbastelle	T8869	Female	NB	38.8	7.7	Large ET	0.47	6.1
17	Barbastelle	T8862	Female	PL	39.7	8.1	Medium ET	0.47	5.8
18	Barbastelle	T8867	Female	Juvenile	38	7.7	Medium ET	0.35	4.5
-	Barbastelle	-	Female	Juvenile	32	4.9	-		
19	Barbastelle	T8868	Male	Juvenile	37.8	7.1	Long and thin ET	0.35	4.9
20	Barbastelle	T8863	Female	PL	39.4	7.9	Large ET	0.47	5.9
21	Natterer's bat	-	Female	PL	40.2	9.4	-	0.47	5.0
22	Natterer's bat	-	Female	NB	40.4	8.6	-	0.47	5.5

30 July – Fiscal Policy(T1)

ID	Time	Species	Sex	Breeding status	Forearm length (mm)	Weight (g)	Trap	Bat no.	Comments
1	21:00	Soprano pipistrelle	M	Juvenile	32.4	5.1	Double HT		
2	21:00	Common pipistrelle	F	PL	32.5	5.7	Double HT		
3	21:05	Common pipistrelle	M	TS	31.44	4.7	Double HT		
4	21:10	Soprano pipistrelle	F	PL	31	5.9	Double HT		
5	21:10	Brown long-eared bat	M	TS	38.7	7.4	Double HT		
6	21:15	Common pipistrelle	M	TS	31.6	4.8	Double HT		



ID	Time	Species	Sex	Breeding status	Forearm length (mm)	Weight (g)	Trap	Bat no.	Comments
7	21:20	Common pipistrelle	M	NB	31.3	4.7	Double HT		
8	21:20	Common pipistrelle	F	PL	32	5.5	Double HT		
9	21:25	Soprano pipistrelle	M	TS	31.5	5	Double HT		
10	21:30	Common pipistrelle	M	TS	32	5.2	Double HT		
11	21:30	Soprano pipistrelle	F	PL	33.3	5.8	Double HT		
12	21:35	Common pipistrelle	F	NB	33.3	5.3	Double HT		
13	21:40	Common pipistrelle	M	TS	33.2	5.3	Double HT		
14	21:40	Soprano pipistrelle	F	NB	31.7	6.3	Double HT		
15	21:45	Soprano pipistrelle	F	PL	31.5	5.5	Double HT		
16	21:45	Soprano pipistrelle	F	PL	31.8	5.1	Double HT		
17	22:00	Soprano pipistrelle	M	TS	30.8	5.5	HT3		
18	22:25	Natterer's bat	M	NB	39.4	7.8	HT3		
19	22:25	Natterer's bat	M	Juvenile	39	7.6	HT4		
20	22:25	Natterer's bat	F	NB	41.1	7.8	HT4	1	
21	22:25	Nathusius' pipistrelle?	M	Juvenile	31	4.1	HT1		
22	22:25	Common pipistrelle	M	TS	30	4.8	HT1		
23	22:35	Common pipistrelle	F	NB	33.2	5.9	HT2		
24	22:45	Serotine	F	PL	52.8	22.9	HT4		
25	22:45	Common pipistrelle	M	TS	31.8	4.5	HT4		
26	22:45	Soprano pipistrelle	F	PL	32	5.8	HT3		
27	22:45	Common pipistrelle	M	Juvenile	32.2	4.7	HT4		



ID	Time	Species	Sex	Breeding status	Forearm length (mm)	Weight (g)	Trap	Bat no.	Comments
28	22:45	Soprano pipistrelle	M	TS	31.8	4.8	HT1		
29	22:45	Soprano pipistrelle	M	TS	30	5.1	HT1		
30	22:45	Common pipistrelle	F	PL	32.9	6	HT4		
31	23:45	Natterer's bat	F	PL	39.5	8.7	MN2	2	
32	23:45	Natterer's bat	M	TS	38.9	7.4	HT3		
33	23:45	Common pipistrelle	M	TS	32.9	5.4	HT1		
34	23:45	Soprano pipistrelle	M	TS	30.7	5.1	HT4		
35	00:14	Soprano pipistrelle	F	NB	32.7	5.5	HT1		
36	00:14	Soprano pipistrelle	M	TS	30.02	5.5	HT1		
37	00:14	Soprano pipistrelle	M	TS	31.4	5.1	HT3		
38	00:50	Soprano pipistrelle	F	PL	32.6	5.1	MN3		
39	00:50	Soprano pipistrelle	M	TS	30.4	5.2	HT3		
40	03:00	Soprano pipistrelle	M	TS	31.5	4.9	MN2		
41	03:00	Soprano pipistrelle	F	PL	31.9	5.4	HT4		
42	03:40	Common pipistrelle	M	TS	32.2	5.9	HT4		

31 July – Turf Pits (T2 and T8)

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
43	20:45	Soprano pipistrelle	M	TS	31.6	4.9	HT1		
44	21:45	Natterer's bat	F	PL	38.7	8.4	MN3		

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
45	21:45	Barbastelle	F	NB	39.6	8.7	MN3	3	Medium ET, Fused joints, patchy wings.
46	22:00	Brown long-eared bat	M	NB	37.8	8.3	MN6		
47	22:30	Natterer's bat	F	LACT	39.9	8.2	HT1		
48	22:30	Brown long-eared bat	M	TS	37.7	6.4	HT1		
49	22:45	Soprano pipistrelle	F	PL	31.9	5.8	HT3		
50	22:45	Soprano pipistrelle	F	PL	33	5.4	HT4		
51	22:45	Natterer's bat	M Juvenile	NB	37.3	6.2	Sky		
52	22:45	Soprano pipistrelle	M	TS	31.1	5.6	MN7		
53	23:00	Soprano pipistrelle	M	NB	30	4.5	HT1		
54	23:06	Soprano pipistrelle	M	TS	33.1	6.4	HT4		
55	23:06	Common pipistrelle	M	NB	31	4.4	HT3		
56	23:06	Soprano pipistrelle	F	NB	30.5	4.5	HT3		
57	23:30	Soprano pipistrelle	F	PL	31	6.1	HT1		
58	23:30	Natterer's bat	F	PL	40.4	8.7	Sky		
59	23:30	Natterer's bat	F	L	39.6	9.1	MN5		
60	00:21	Soprano pipistrelle	M	TS	30.4	5.3	MN1		
61	00:55	Soprano pipistrelle	F	NB	30.24	5.4	Sky		
62	01:00	Brown long-eared bat	M	TS	38.3	7.9	MN1		
63	01:15	Common pipistrelle	F	Juvenile	32.4	4.6	HT3		
64	01:45	Soprano pipistrelle	F	PL	32.1	5.4	MN7		
65	01:45	Brown long-eared bat	F	PL	39.7	9.1	MN6	4	
66	02:10	Common pipistrelle	M	TS	31.3	4	HT2		



ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
67	02:10	Common pipistrelle					HT2		Escaped
68	02:10	Natterer's bat	M	TS	40.2	8	HT1		
69	02:20	Barbastelle	M	Juvenile	38.2	7.1	Sky	5	No ET
70	02:45	Soprano pipistrelle	M	TS	31.4	5.2	MN3		
71	02:45	Soprano pipistrelle	F	PL	33.9	5.1	MN1		
72	02:45	Soprano pipistrelle	M	TS	30.7	4.8	HT1		
73	02:45	Soprano pipistrelle	M	TS	30.9	4.9	HT4		
74	03:15	Brown long-eared bat	F	PL	38.3	9.3	HT1		
75	03:40	Common pipistrelle	F	NB	32.1	5.8	HT4		
76	03:40	Soprano pipistrelle	M	TS	30.5	4.7	MN3		
77	03:40	Brown long-eared bat	M	NB	37.2	8.8	MN1		
78	03:40	Natterer's bat	M	NB	40.1	7.9	HT1		
79	03:40	Natterer's bat	F	NB	40.5	8.5	MN1		
80	04:20	Barbastelle	F	PL	38.9	10.4	Sky	6	-
81	04:20	Barbastelle	M	NB	39.8	9.2	HT1	7	Medium ET
82	04:20	Soprano pipistrelle	M	TS			mn1		Released due to late capture
83	04:20	Natterer's bat	M	TS			HT4		Released due to late capture
84	04:20	Barbastelle	F	PL	40.4	9.9	Sky	8	Small ET

1 August – Upper Abbey Track (T3)

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
85	21:30	Soprano pipistrelle	F	Juvenile	30.15	5.4	HT4		
86	21:45	Natterer's bat	M	NB	37.5	8.3	HT4		
87	23:35	Natterer's bat	F	Juvenile	40.8	7.8	HT1		
88	00:15	Natterer's bat	F	NB	39.4	9.4	HT4		
89	01:20	Soprano pipistrelle	F	PL	31.4	6.2	MN3		
90	01:25	Soprano pipistrelle	M	TS	30.7	5.1	HT4		
91	01:56	Soprano pipistrelle	M	Swollen epididymis?	31.1	4	HT1		
92	02:04	Soprano pipistrelle	M	Juvenile	31.9	4.4	HT4		
93	02:35	Soprano pipistrelle	M	NB	29.4	4.3	HT2		
94	03:40	Barbastelle	F	PL	37.9	11.3	MN2	9	Medium ET
95	03:40	Soprano pipistrelle	M	TS	30.4	4.9	MN2		
96	04:00	Brown long-eared bat	M				MN2		Released quickly due to late capture
97	04:00	Brown long-eared bat	M	TS			HT4		Released quickly due to late capture

2 August – Tree Roost R14

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
98		Barbastelle	M	Juvenile	38.5	5.9	R14	10	Medium ear tags

Also recapture of bat 3 with failed tag – aerial cut off and ring OK

2 August – Sandlings Walk

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
99	21:35	Soprano pipistrelle	M	TS	31	5.2	Sky		
100	21:57	Soprano pipistrelle	F	PL	32.2	6.1	HT3		
101	22:17	Common pipistrelle	F	PL	32.3	5.9	HT3		
102	22:30	Brown long-eared bat	F	NB	40.6	9	Sky		
103	22:30	Brown long-eared bat	M	NB	40.4	7.7	Sky		
104	22:30	Serotine	M	TS	49.9	22.8	Sky		
105	22:30	Serotine	M	TS	51.1	22	Sky		
106	22:30	Serotine	F	PL	53	23.7	Sky		
107	22:30	Brown long-eared bat	F	L	39.4	6.6	Sky		
108	23:30	Serotine	M		50	22	Sky		
109	22:50	Natterer's bat	F	PL	38.4	8.7	MN5		
110	22:50	Common pipistrelle	M	NB	31.6	5.8	HT2		
111	23:00	Common pipistrelle	M	NB	33	4.9	HT1		

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
112	23:30	Soprano pipistrelle	F	PL	33.6	6.7	HT1		
113	23:30	Serotine	F	PL	54.1	29.7	Sky		
114	23:30	Serotine	M		51.3	25.7	Sky		
115	23:30	Serotine	F	NB	54.1	27	Sky		
116	23:30	Serotine	F	PL	54.4	29.6	Sky		
117	23:55	Natterer's bat	M	NB	38.5	7.8	HT1		
118	23:50	Soprano pipistrelle	M	TS	30.4	4.4	MN3		
119	23:50	Common pipistrelle	F	PL	31.6	6.3	HT2		
120	23:50	Soprano pipistrelle	F	PL	29.2	5.6	HT2		
121	00:19	Brown long-eared bat	F	PL	36.9	8.86	Sky		
122	01:19	Brown long-eared bat	M	TS	38.7	7.5	Sky		
123	01:19	Brown long-eared bat	F	PL	39.1	7.9	Sky		
124	01:19	Brown long-eared bat	M	NB	38.9	9	Sky		
125	01:45	Natterer's bat	F	NB	41.7	8.5	HT1		
126	03:22	Soprano pipistrelle	M	TS	31.8	4.8	HT2		
	04:10	Barbastelle	M				MN4		Recapture of bat 10

3 August – Tree Roost R9

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
127	20:30	Barbastelle	F	PL	39.3	9.4		11	Very small ET
128	20:30	Barbastelle	M	Juvenile	36.9	6.6		12	Medium ET
129	20:30	Barbastelle	F	PL	39.5	9.3		13	Large ET
130	20:30	Barbastelle	M	Juvenile	36.5	6.9		14	Large ET
131	20:30	Barbastelle	M	Juvenile	37.2	7.1		15	Very small ET
132	20:30	Barbastelle	F	NB	38.8	7.7		16	Large ET
133	20:30	Barbastelle	F	PL	39.7	8.1		17	Medium ET
134	20:30	Barbastelle	F	Juvenile	38	7.7		18	Medium ET
135	20:30	Barbastelle	F	Juvenile	32	4.9		-	
136	20:30	Barbastelle	M	Juvenile	37.8	7.1		19	Long and thin ET
137	20:30	Barbastelle	F	PL	39.4	7.9		20	Large ET

3 August – The Grove (T4)

ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
138	00:15	Soprano pipistrelle	F	PL	32.1	5.7	HT3/4		
139	01:25	Natterer's bat	F	PL	39.7	9.4	HT4		
140	01:55	Natterer's bat	M	NB	38.8	8	HT3/4		
141	02:15	Natterer's bat	F	PL	40.2	9.4	HT4	21	
142	02:15	Natterer's bat	M	TS	36.9	7.4	HT4		



ID	Time	Species	Sex	Breeding Status	Forearm (mm)	Weight (g)	Trap	Tag number	Comments
143	03:15	Natterer's bat	F	NB	40.4	8.6	HT3/4	22	
144	03:05	Brown long-eared bat	M	NB	39	8.4	HT1		
145	04:09	Natterer's bat	M	TS	38.5	7.9	MN2		
146	04:15	Soprano pipistrelle	F	PL	30.3	4.7	HT3/4		
147	04:20	Brown long-eared bat	F	Lactating	42.6	9.4	HT3/4		
	04:30	Brown long-eared bat	F	Recapture of bat 147			HT3/4		
148	04:30	Brown long-eared bat	F	Lactating	42.7	10.8	HT3/4		

Table C2 Description of Roosts used by Tracked Bats³²

Roost no.	Bat no.	Area	Tree/Building	Species	DBH (cm)	Height (m agl)	Description of roost feature
R1	1 + 2 (2010)	east-west track	Tree	Oak	c.90	5m	Rotten branch with flaking bark on branch and trunk c 5m agl SSE facing.
R2	2 (2010)	east-west track	Tree	Oak	80	c.4m	Split bark on forked limb SSE facing. Both forks have potential.
R3	3,4 (2010)	Ash Wood	Tree	Oak	100	4-8m	Peeling bark on northern forked limb (4m-8m). Signal loudest on NW side @ 4.5m agl.
R4	3 (2010)	Grimseys	NA	NA	NA	NA	Area around Grimseys - roost location not known.
R5	3 (2010)	The Grove	Tree	Oak	38	3-6m	Flaking bark on vertical stem.
R6	5 (2010)	Greenhouse Plantation	Tree	Dead tree	40	7 - 8m	Dead flaking bark on trunk, bat on north-west side at c7m agl.
R7	1 (2010)	The Grove	Tree	Oak	90	10m	Tree is full of potential features from 3m agl to top c 16m agl. Main feature where bats roosting torn off limb on north side with deep fissure, 10m agl.
R8	5 + 6 (2010)	The Grove	Tree	Oak	60	3m	Loose bark below split limb on Eastern side. Several access holes noted.
R9	5 + 6 (2010) 5, 6, 8-20 (2011)	Ash Wood	Tree	Oak	c.80	6-8m	Key features are splitting limbs and loose bark towards the top of the tree (radio signal was strongest higher up). Cracks in bark also noted lower down plus woodpecker hole on S face @ c.6-8m.
R10	7	Wood Farm Barn	Barn				Barn with timber weatherboarding and corrugated metal roof.

³² agl = above ground level; DBH = diameter at breast height.

Roost no.	Bat no.	Area	Tree/Building	Species	DBH (cm)	Height (m agl)	Description of roost feature
R11	6	Nursery Covert	Tree	Elm	c.30	3-5m	Loose bark towards the top of the tree and woodpecker hole on S face at c.4m.
R12	5	Hangman's Wood	Tree	Oak	c.100	3-4m	Features throughout including splits and fissures. NB large cavity and split on face of main stem.
R13	5 +6 (2010) 8, 13, 19 (2011)	Ash Wood	Tree	Oak	c.80	4-6m	Main feature is split horizontal limb that extends north from main stem at c.5m and then upwards.
R14	5,6, 8, 10	Ash Wood	Tree	Oak	45	15+	Loose bark on horizontal limb to south c.12m.
R15	8	Nursery Covert	Tree	<i>Pinus</i> sp.	35	8 to 15	Numerous woodpecker holes, unsure which feature is being used.
R16	7	Kenton Hills	Tree	<i>Salix</i> sp.	100	6 to 10	Snapped off limb with w/p holes on north face. Cavity may extend south down limb. Another good feature adjacent in snapped limb.
R17	5, 6, 9, 12, 13, 14, 16, 17, 18, 20	Plantation Cottages	Tree	Sweet Chestnut	45 each	8 to 12	Twin stem. Lots of dead wood and loose bark on both stems. Two w/p holes on face of north stem. Signal strongest 8-10m of north stem. Loose plate of bark here. Loose bark all way to base on n face of north stem.
R18	11, 20	Kenton Hills	Tree	Oak	70 to 80	likely 3 to 5 m	Likely feature is large split in snapped limb (main ssw limb). Probably extends. Lots of dead wood and loose bark on tree, twisted appearance.
R 19	5,8,12,13,14,16,19	Plantation Cottages	Tree	Oak	150		Unsure of exact feature. Likely to be large snapped limb one side with horizontal split at 8m. Another snapped limb at c 4-6 m one face and hung up tree with split.
R20	11, 17	east-west track	Tree	Sweet Chestnut	65		Likely split limb on east face. Dying tree, stag headed but some foliage in canopy. Bracken understorey.
R21	5, 11, 13, 14, 16, 17, 19	Old Abbey Farm Woodland	Tree	Oak	100	9-13m	Large vertical split from 9-13m on northern face.

Roost no.	Bat no.	Area	Tree/Building	Species	DBH (cm)	Height (m agl)	Description of roost feature
R22	7	Hill Farm	Hill Farm, Barn	NA			Concrete breeze block and corrugated sheet modern agricultural barn. Strongest signal NE corner.
Other Bat Species							
RA	1, 2	Leiston Abbey ruins	Building				
RB	4	-	-	-	-	-	Unknown specific roost - area towards the north of Rockyard wood.
RC	4	Small, brick bungalow	Small, brick bungalow				
RD	22	Bat box fixed to pine tree	Bat Box				
RE	21	Sandpytle Plantation	Tree	Alder	30	C5m	Wet woodland with willow, alder and bracken understorey. Oak standards towards edge. Large wound at c.5m one face. Looks like old snapped limb. Unclear how far cavity extends but lots of dead and rotting wood.
RF	21	The Grove	Tree	Oak	40 - 50	5 – 10m	Mature oak with three w/p holes at 5-10m on s face and one further hole on north face. On the eastern edge of the grove woodland on the eastern bank of the stream.



Table C3 Trapping Locations of Tagged Bats and Details of their Roost use in 2011

Bat no.	Species	30/07	31/07	01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	09/08	10/08	11/08
1	Natterer's bat	Caught Fiscal Policy	RA	RA	RA	RA	RA	RA	RA	RA	Tag failed	-	-	-
2	Natterer's bat	Caught Fiscal Policy	RA	RA	lost tag	-	-	-	-	-	-	-	-	-
3	Barbastelle	Caught Turf Pits	Tag funny	R14	-	-	-	-	-	-	-	-	-	-
4	BLE	Caught Turf Pits	RB	RC	RC	RC	RC	RC	RC	RC	RC	Static in RC?	Lost tag	Lost tag
5	Barbastelle	Caught Turf Pits	R14	R9	R17	R17	R19	R21	Poss lost tag R21				-	-
6	Barbastelle	Caught Turf Pits	R14	R9	R9	R17	R17	R17	Poss lost tag (R17)					
7	Barbastelle	Caught Turf Pits	R16	?	?	?		R22	R22	R22	R22	R22	R22	R22
8	Barbastelle	Caught Turf Pits	R15	R14	R9	R13	R19	Lost tag nr R19	-	-	-	-	-	-
9	Barbastelle		Caught Abbey Lane	R9	R9	R17	R17	Poss lost tag nr 3g	-	-	-	-	-	-
10	Barbastelle			Caught R14	R9	R9	R9	Taken in	-	-	-	-	-	-
11	Barbastelle				Caught R9	R18	R20	R21	Poss lost tag R21	-	-	-	-	-
12	Barbastelle				Caught R9	R9	R19	R17	Poss lost tag (R17)	-	-	-	-	-
13	Barbastelle				Caught R9	R13	R19	R21	R21	R21	R21	R21	R21	R17



Bat no.	Species	30/07	31/07	01/08	02/08	03/08	04/08	05/08	06/08	07/08	08/08	09/08	10/08	11/08
14	Barbastelle					Caught R9	R17	R19	R17	R17	R17	R21	R21	R21
15	Barbastelle					Caught R9	R9	Grounded	-	-	-	-	-	-
16	Barbastelle					Caught R9	R17	R19	R17	R17	R17	R21	R21	R21
17	Barbastelle					Caught R9	R17	R20	R21	Poss lost tag R21	-	-	-	-
18	Barbastelle					Caught R9	R17	R17	R17	R17	R17	R17	R17	R17
19	Barbastelle					Caught R9	R13	R19	R21	Poss lost tag R21	-	-	-	-
20	Barbastelle					Caught R9	R18	R17	R17	Tag poss lost (R17)	-	-	-	-
21	Natterer's bat					Caught The Grove	RE	RE	Not found	RF	RE	RF	RF	RF
22	Natterer's bat					Caught The Grove	RD	RD	RD	RD	RD	RD	RD	RD

Table C4 Summary of 95% Home Range sizes in hectares (ha)

Barbastelle breeding female					Natterer's bat breeding female				
Bat no	MCP	Cluster	Number core areas	Kernel	Bat no	MCP	Cluster	Number core areas	Kernel
6	165.2	19.7	6.0	246.0	1	63.8	13.8	3	62.3
8	128.1	226.8	1.0	202.9	2	58.2	58.2	1	121.9
9	322.8	101.7	3.0	454.4	21	117.4	64.8	2	79.3
11	216.1	216.5	1.0	303.3	22	53.9	17.4	2	52.0
13	547.4	286.7	3.0	508.1	22 is non-breeding female				



17	285.2	73.3	3.0	315.5
20	236.3	71.8	3.0	231.2
Average	271.6	142.4		323.1
(Average excluding 8)	295.5	128.3		343.1

Barbastelle non breeding female

Brown long eared bat

Bat no	MCP	Cluster	Number core areas	Kernel	Bat no	MCP	Cluster	Number core areas	Kernel
3	57.3	82.2	1	101.1	4	225.4	50.5	4	170.7
16	319.5	63.9	5	380.3					

Barbastelle juvenile

Bat no	MCP	Cluster	Number core areas	Kernel
5	239.2	70.0	3.0	248.8
12	11.2	4.5	2.0	20.4
14	199.3	120.6	2.0	194.5
18	352.8	140.1	4.0	315.5
19	121.9	46.8	2.0	98.8
Average	184.9	76.4		175.6
Average excluding 12	219.6	90.8		206.6

Barbastelle adult male

Bat no	MCP	Cluster	Number core areas	Kernel
7	490.3	216.4	2.0	663.6



Detailed Notes on Movements of Tagged Barbastelles

Bat 3

This bat, a non-breeding female, was caught at Turf Pits on 31 July. The tag began malfunctioning as soon as the bat took flight. After being released it moved to Nursery Covert and was static for almost an hour. Eight joint bearings were then taken for this bat confirming it foraging as widely as Round Covert (to the south of Sandy Lane), in the area of Grimseys and the adjacent belts, in Kenton Hills and Hilltop Covert. It was recaptured from tree roost R14 on 2 August and the aerial cut off as the tag had malfunctioned and stopped working.

Bat 5

This bat, a juvenile male, was caught at 02:20 on the night of 31st July at Goose Hill (T8). Twenty-one joint bearings were taken with 15 single point estimates. The bat foraged widely in the area of Black Walks, Goose Hill and The Grove, the field network around Ash Wood and Kenton Hills and Sizewell Belts in the south. During 1-6 August the bat roosted in tree roosts R14, R9, R17, R19 and R21. A static signal from R21 on 6 August indicated that the tag had been dislodged.

After release the bat stayed around Nursery Covert and Kenton Hills before roosting in R14 on the western side of Ash Wood on 1 August. On the night of 1-2 August it was recorded moving between Goose Hill and Ash Wood. Between 00:48 and 01:10 the bat was recorded flying circuits around Goose Hill. At 02:11 the bat moved north towards Ash Wood and was confirmed as static in R14 (Ash Wood) at 04:53.

On the night of 2 August it was first recorded at 21:40 flying from Ash Wood towards Sizewell Belts. At 21:59 it moved west to the south side of Kenton Hills. From 01:47 it flew through the northern half of Goose Hill before moving north to the Grove at 02:08. From 02:46-56 the bat was tracked foraging around the southern half of Goose Hill. By 03:26 the bat had drifted northwards and was reacquired at 03:55 in the direction of Lower Abbey Farm. As the bat was later found during the day in roost R17 adjacent to Plantation Cottages, it is assumed that the bat had returned to its roost tree early.

On the night of 3 August it was first recorded during 01:30-40 in the eastern side of Goose Hill. At 02:27 it was over the fields between Black Walks and Ash Wood, where it was again recorded at 03:28 and 03:37.

On the night of 4 August the bat was found in the area of The Grove at 21:59. By 22:24 it foraged in the northern half of Goose Hill and at 22:34 it had returned north to the Grove. At 23:27 the bat was thought to be static at or very close to roost R9 in Ash Wood. At 00:07 it was recorded in the direction of Lower Abbey Farm but was not found from 00:55. It was not present within the area of Eastbridge, Minsmere Cut or Minsmere Reserve or in the typically frequented areas of the Sizewell Estate. At 04:08 it was found flying over fields north of the Round House and north-west of Ash Wood. By 04:50 it was confirmed as static in the woodland adjacent to Plantation Cottages and found in tree roost R17 during the day on 5 August.

On the night of 5 August it foraged close to the woodland adjacent to Plantation Cottages from 21:44 to 22:37. From 22:47 through 22:52 successive fixes were taken as the bat flew rapidly to the south towards Ash Wood then back to the woodland adjacent to Plantation Cottages using

various field boundaries. At 00:51 it was active in the vicinity of Leiston Old Abbey Woods where it was reconfirmed at 01:42 and 01:44. By 03:01 it was static in tree roost R21.

On 6 August, the signal strength suggested it was moving within Old Leiston Abbey Woods between 21:13 through 21:25. Beyond that point the bat was not recorded flying elsewhere and at 03:48 it was thought to be static at roost R21 within Old Leiston Abbey Woods, when the tag was assumed to have been dislodged.

Bat 6

This bat, a post-lactating female, was caught at 04:20 on the night of 31 July at Goose Hill (T8). Thirty seven joint bearings were taken over four nights with four single bearing estimates plotted from monitoring and close tracking. The bat was recorded foraging as widely as the south-eastern corner of Goose Hill, the fields and dunes adjacent to the sea and south over the sea wall bund by Sandlings Walk. During 1-6 August it used tree roosts R14, R9 and R17. From 7 August the signal was static in roost R17 and the tag was believed to have been dislodged.

On the night of 1 August the bat was first recorded between Grimsey's, Goose Hill and the sea wall bund from 21:51, although no accurate joint bearings were achieved. From 22:11 the bat foraged in the fields and dunes adjacent to the sea wall and east of Goose Hill until 23:57 when it headed back north. It was tracked near Ash Wood at midnight where it appeared to remain until at least 00:45. It was then recorded by a single surveyor in the Goose Hill area again from 01:55 to 02:53 and then back in Ash Wood when it was static by 04:53.

On the night of 2 August the bat was recorded in a similar area to the previous night and in Goose Hill from 21:40 to 23:22. From 00:06 it was recorded static in Ash Wood. Although the specific tree was not found it was on the western side of the wood. From 02:11 it flew rapidly south through Goose Hill to the Sizewell Belts south of Sandlings Walk before rapidly moving back north to Goose Hill where it flew circuits around the woodland. At 03:38 it was recorded heading north and by 03:40 it was back at Ash Wood. It returned to Goose Hill at 03:59 and the fields between Goose Hill and the sea wall until 04:15 when it was recorded again heading north. It was recorded in roost R9 during the day.

On the night of 3 August it was not re-caught during trapping from tree roost R9. From 02:16 it was recorded in the Lower Abbey woods area where it was recorded throughout the rest of the night. On the night of 4th August, only occasional single bearings were taken of this bat with other barbastelle bats being prioritised for joint bearings. These bearings were all towards the Lower Abbey Woods area and it is thought that the tag was dislodged in roost R17.

Bat 7

This bat, a non-breeding male, was caught at 04:20 on the night of 31 July at Goose Hill (T8). A total of 24 joint bearings were achieved with a further 15 single point estimates. The bat was found roosting at R16 on 1 August on the south side of Kenton Hills. From 6-11 August it was confirmed roosting at a barn at Hill Farm west of the Sizewell Estate. The bat was recorded foraging widely over the southern half of the Sizewell Estate, in Kenton Hills and Sizewell Belts, around Sandy Lane and Leiston Common and to the west around Theberton and Eastbridge.

On 1 August the bat was recorded in the Nursery Covert and Sizewell Belts areas until 22:26. Then from 02:32 it was recorded in the area south and west of Theberton where it seemed to remain. The roost area of the bat was not found on 2 August but in the evening, a surveyor on

the sea wall recorded it flying east into the Sizewell Belts area at 22:19. It then headed into Nursery Covert before heading south towards Reckham Pits Wood.

The day roost was again not found on 3 August. On the evening of 3 August the bat was first recorded flying south-east towards the site in the area between Birch Farm and Eastbridge at 02:30. It was then recorded to the west around Leiston Abbey, although no joint bearings were achieved.

On 4 August, the bat was first recorded at 22:48 moving towards the site from the Greenhouse Plantation area; it then moved west and was recorded in the Leiston Abbey ruins area for over an hour. At 00:42 it was recorded around the Theberton Plantation, an area used by barbastelles during the 2010 radiotracking study. Bat 7 then returned to the west of Leiston Abbey.

On the night of 5 August, it was recorded west of the site at 22:39 and then from 01:23 it was recorded flying around the area of fields and woodland around Old Abbey Farm with a last bearing taken of this bat at 03:46. The day roost was found on 6 August, in a modern agricultural building at Hill Farm (R22) and it continued to use this roost thereafter. On the night of 6th August, it was first recorded north-east of Leiston Abbey Ruins before heading back to the roost area. It was then recorded over the Sizewell Belts area between Reckham Pits Wood and Grimseys Wood between 23:27 and 00:35 before heading west towards the sewage works at 00:55. It then moved between the area west of Hill Farm and Sizewell Belts on a number of occasions before being found north of Old Abbey Farm at 03:40 and again at 04:19.

On the night of 7 August it was first recorded to the west towards Moat Farm at 22:00. It was then recorded heading east at 22:05, just north of Hill Farm and then found six minutes later just west of the Leiston Abbey Ruins. From 23:51 until 00:11 and later at 01:02 it was recorded in the Sizewell Belts and Leiston Common area. It was recorded back towards the woodland around Leiston Old Abbey and Old Abbey Farm at 03:35 and 04:19.

On the night of 8 August it was recorded in the area of Leiston Old Abbey and Old Abbey Farm from 22:34 to 22:46. From 23:10 until 00:02 and 02:13 until 03:09 it was recorded around Sizewell Belts, Leiston Carr and the southern edge of Kenton Hills. It then headed north-west and into woodland at Leiston Old Abbey and Old Abbey Farm. It was then recorded back at its roost at 03:40 before leaving the roost at 03:54 and flying to the Kenton Hills/Sizewell Belts area where it remained until 04:22 before returning to its roost.

On 9 August it was recorded north of Eastbridge at 23:51. At 02:04 it was recorded close to Upper Abbey track and then at Leiston Abbey ruins at 02:20. No further joint bearings were taken of this bat but it was recorded west of the site and then near its roost from 04:00 onwards.

On 10th August the bat was not monitored as surveyors focussed on other bats but it was acquired several times flying west in the direction of Hill Farm.

Bat 8

This bat, a post-lactating female, was caught at 04:20 on the night of 31 July at Goose Hill (T8). From 1-5 August the bat was confirmed using tree roosts R15, R14, R9, R13 and R19. On 6 August the tag was found hanging in bracken near roost R21, presumably having been groomed from the bat. A total of 12 joint bearings and 12 single point estimates were recorded before the tag came off. The bat foraged as widely as Kenton Hills/Nursery Covert, Ash Wood and north into Minsmere.

After being caught and tagged late in the night when the traps and mist nets were being taken down, the bat roosted (R15) near to where it was released in Nursery Covert. This was the only pine *Pinus* sp. tree used by roosting barbastelles in 2010 and 2011 and it was considered to be an atypical and temporary roost.

On the night of 1 August, having left its roost in Nursery Covert, it was recorded flying north from Ash Wood along the line of Scots pine *Pinus sylvestris* trees towards Black Walks at 21:42. It appeared to remain close to Ash Wood until 22:25 when it was recorded flying east towards the Grove. Between 22:28 to 22:31 it flew north-west towards Eastbridge. By 22:59 the bat had returned to the east of Ash Wood and was in the vicinity of The Grove at 23:17. It was then active over the fields between Ash Wood and The Grove, north to Black Walks and south along the northern edge of Goose Hill with recordings taken at 00:39, 01:00, 01:53, 02:13 and 02:19. By 04:40 it was confirmed as static in the centre of Ash Wood and confirmed in roost R14 (Ash Wood) in the day.

On the night of 2 August it was recorded on single bearings around Ash Wood at 23:00 and then to the north of the site at Lower Abbey between 00:21 and 00:34 and then at 01:56 and 02:36. From 03:39 the bat was recorded back in Ash Wood. Thereafter it was moving rapidly within the wood making joint bearings difficult to achieve. Two brief forays were made to Plantation Cottages then back to Ash Wood at 04:36 and 04:39. It then settled in Ash Wood at 05:00 and was found in roost R9 during the day.

On the night of 3 August, bat 8 was not re-caught during trapping at tree roost R9. After trapping the bat was recorded north of Lower Abbey. At 02:14 the bat flew east towards the Grove and then headed south. It was then recorded back in Ash Wood before it moved north again to the Black Walks area. It moved back to Ash Wood and was recorded roosting in tree roost R13 during the day.

On the night of 4 August the bat was recorded at 21:35 flying east from Ash Wood to The Grove. It then moved west onto Abbey Lane where it flew up and down the lane before heading south into Kenton Hills and Nursery Covert at 22.45 after which point it was lost. At 23:43 the bat had returned to Ash Wood and then headed north towards Lower Abbey Farm and Black Walks. At 01.04 the bat was recorded back in Ash Wood again but then flew west at 01:15 and was lost. Subsequently two single bearings were achieved to the west of Hangmans Wood and then heading north towards Minsmere. At 03:49 the bat was located to towards Eastbridge and recorded in the woodland adjacent to Plantation Cottages at 04:57. During the daytime survey on 5th August the bat was found in roost R19, after which time the tag was dislodged and found near R19.

Bat 9

This bat, a post-lactating female barbastelle, was caught along Abbey Lane (T3) on the night of 1 August at 03:40. A total of thirty-four joint bearings and four single point estimates were recorded before the tag came off. It foraged widely over the southern half of the Sizewell Estate, east to the coastal strip near Goose Hill, south to Sizewell Belts, west to Leiston Old Abbey Woods and north to Black Walks and Minsmere Cut. It used roosts R9 and R17 from 2-5 August. On 6 August a static signal was recorded from an arable field south-west of the Sizewell Estate where the tag had been dislodged from the bat.

After release the bat was recorded in the Ash Wood area and found roosting in tree R9 on 2 August. That evening the bat foraged around the fields and dunes east of Goose Hill, the sea wall bund by Sandlings Walk, in Sizewell Belts near Grimseys and in Goose Hill from 21.44 to

22:58. At 00:31 it was then recorded in Kenton Hills/Nursery Covert and then in the Upper Abbey Track area from 01:54 to 02:17 before moving through Goose Hill and back into the Sizewell Belts area from 02:24. It was recorded at Leiston Common and Sizewell Belts between 03:00 and 03:24 and the junction of Fiscal Policy and Lover's Lane at 03:26, although the exact location could not be found. It was then recorded briefly at Ash Wood at 03:55, before flying south through Goose Hill at 04:05 towards the Sizewell Belts. It remained in Sizewell Belts and Goose Hill before returning north to Ash Wood at 04:26. The following day it roosted in tree R9.

On the night of 3 August, bat 9 was not re-caught during trapping at R9. It was first recorded in the Sizewell Belts/Leiston Common area at 01:41, then south of the woodland at Plantation Cottages at 03:30 and at Black Walks at 03:48. From 03:50 the bat was in the general Ash Wood area and before being found roosting west of Plantation Cottages (R17) on 4 August.

On the night of 4 August at 21:22 it moved rapidly south of Ash Wood and into Goose Hill reaching the Sizewell Belts by 21:30. It was pinpointed in Kenton Hills at 22:00 and the fields east of Upper Abbey track before being recorded either side of Grimseys woodland. At 23:07 23:55 and 01:16 single bearings suggested it was in the vicinity of the Leiston Old Abbey woodland. It was then recorded at 01:39 in the Kenton Hills/Sizewell belts area and then around Leiston Common at 02:36 and 02:38. At 03:25 it was recorded to the north at Minsmere Cut and then at 04:05 in the Black Walks area where it remained. It was found roosting in tree R17 during the day of 5th August.

On the night of 5th August other bats were prioritised. It was recorded near Leiston Old Abbey woods at 23:55 and then at Kenton Hills at midnight. It was not recorded after this point, and on 6 August a daytime bearing from near Buckleswood Road implied that the tag was dislodged.

Bat 10

This bat, a juvenile male, was caught emerging from tree roost R14 on 2 August. It was ringed, tagged and released on the south side of Goose Hill. After release it remained static in trees in Sizewell Belts. It was recorded flying in Kenton Hills at 03:24 and then foraging south of Sandlings Walk, near the sea wall bund and in Goose Hill from 03:42 to 03:59. It then tracked in a southerly direction around the eastern side of Goose Hill and was recaptured in a mist net at 04:10 on the southern side of Goose Hill. Given the late recapture, it was considered that the best option was to release it at Ash Wood. The bat flew away into Ash Wood and was later confirmed in tree roost R9.

It was noted during night tracking from 3 to 5 August that bat 10 was not recorded flying since its recapture and subsequent release at Ash Wood on the morning of 3 August. After the grounding and death of bat 15 (see below) there was concern that bat 10 may not be foraging. During 3-5 August there was also an apparent switch and division of the colony to using a variety of tree roosts away from Ash Wood, including tree roosts R17 and R20 by Lower Abbey Farm, R19 on the south side of Kenton Hills and R21 on the north side of Kenton Hills. On 6 August tree roost R9 was observed from sunset using the radio-tracking equipment and an infra red camcorder. The bat appeared shortly after sunset from behind loose bark where it rested on an exposed section of the tree. The bat made no attempt to fly or call and appeared very lethargic. It was observed for several hours and no other bats were recorded visiting the roost. As the bat could be reached safely without disturbing the loose bark, the decision was made to retrieve the bat and to give it food and water in the hope of being able to revive and release it.

Its condition was assessed as weak, although the ring was in a normal position without causing any abrasions and the transmitter was also in a normal position. The bat took water and mealworms regularly and goat's milk was also used to supplement its diet. The bat was cared for until 9 August until it died that morning. It was intended to release the bat on the evening of 8 August by returning it to roost R9 shortly before sunset, however, the forecast on the afternoon of 8 August was for thunderstorms and the decision was taken to attempt to release it the following morning and return it to the colony when other bats had returned to the roost. It was considered that the risk of releasing a weakened bat on the night of 8-9 August was too great, due to the forecast of adverse weather conditions that could have impaired its ability to forage.

Bat 11

This bat, a post lactating female, was caught from tree roost R9 on 3 August. Despite issues with the tag frequency drifting ten joint bearings and 23 single point estimates were recorded before the tag came off. It was recorded foraging quite widely into Goose Hill, Kenton Hills, in the Black Walks area and around Leiston Old Abbey Woods. It was confirmed using tree roosts R19 on 4 August, R21 on 5-6 August. From 7 August the signal was recorded as static from R21 and the tag was thought to be dislodged.

After release the bat was recorded flying in the Goose Hill area at 02:05 and Ash Wood between 02:41 and 02:46. At 04:18 the bat was recorded to the south of Goose Hill, then in the Nursery Covert/Kenton Hills area at 04:40. It was recorded later in the evening on a faint bearing north of a surveyor positioned south of Ash Wood. The following day it was found using roost R18 at the southern edge of Kenton Hills with bat 20 (a breeding female).

On the night of 4 August, bat 11 was recorded in the direction of Goose Hill and Ash Wood at 21:14 and in Ash Wood at 21:38, 22:13, 22:30 and 22:49. Then it moved further towards The Grove, Hilltop Covert and east of The Grove before heading back to Ash Wood from 00:43 to 02:04. Between 04:20 and 04:37 the bat was in the Kenton Hills area. It was then recorded during the following day in roost R20 on the northern edge of Kenton Hills with bat 17 (another breeding female).

On the night of 5 August the bat was along the south side of Ash Wood at 23:40 and still around Ash Wood at 23:56. It then flew out of Ash Wood to Hilltop Covert and back to Ash Wood between 00:11 and 00:24. At 00:33 it appeared to be static in Ash Wood for a period. During 01:37-02:10 it was recorded in the woodlands adjacent to Plantation Cottages at 02:23, then to the south in Leiston Old Abbey woodland and Fiscal Policy at 02:26. Between 03:20 and 03:34 it moved between Leiston Old Abbey woodland and Fiscal Policy and then north to the Black Walks area at 03:46 and the Leiston Old Abbey woodland at 04:19. It entered roost R21 around 04:30 and remained there the following day.

On night of 6 August the tag was dislodged from the bat.

Bat 12

This bat, a juvenile male, was caught from tree roost R9 on 3 August. As with bat 11 the tag frequency appeared to drift when the bat was active making it difficult to pick up and only a single joint bearing and seven single point estimates were taken. The bat was recorded foraging in the Black Walks area and Lower Abbey Woods. It was confirmed using tree roost R9 on 4 August, then R19 on 5th August, then R17 on 6 August. From 7 August the signal was recorded as static from R17 and the tag was believed to have become dislodged.

After release it was not recorded until 03:23 when a single bearing was recorded to the west of Ash Wood. It was then recorded in Ash Wood after 04:15 and back in roost R9 on 4 August. On the night of 4 August bat 12 was not recorded until 04:22 in the woodland surrounding Plantation Cottages and was recorded static in this area at 04:39. During the day on 5 August it roosted in R19 to the east of Plantation Cottages.

On the night of 5 August bat 12 foraged south of Plantation Cottages in the Black Walks area. Despite poor signal strength it was recorded flying in the Plantation Cottages/Black Walks area during checks at 21:51, 21:58, 22:03 22:06, 22:38, 23:13, 23:20, 00:35, 03:47 and 04:18-27. It had returned to its roost by 04:36. On 6 August it roosted in R17 to the west of Plantation Cottages with bats 6 (breeding female), 14 (juvenile male), 16 (female non-breeding), 18 (juvenile female) and 20 (breeding female). After this point it was considered that the tag had been dislodged from the bat within tree R17.

Bat 13

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 112 joint bearings were achieved over 8 nights of tracking. Although no further single point estimates were plotted, the single point data was included in the text below. The bat was found roosting at R13, R19, R21, R17 and also R21 (as a night roost). The bat was recorded foraging widely over Goose Hill into Kenton Hills, Leiston Old Abbey woodland, Ash Wood, Black Walks and to the north and west of Eastbridge.

After release the bat was recorded initially north of Ash Wood, in Black Walks and to the west of the Eastbridge road south of Eastbridge before moving to Goose Hill. On the first day after being tagged the bat moved to tree roost R13 in the north-west corner of Ash Wood. On the evening of 4 August the bat emerged early and was in Goose Hill at 21:11 at 27 minutes after sunset. It foraged consistently around Goose Hill before heading north to Ash Wood at 22:39 and then in the Doves Hill Plantation/Minsmere direction. At 01:04 the bat was recorded in the Ash Wood area. At 02:30 the bat was recorded again near The Roundhouse and Black Walks and at 02:46 at Ash Wood. At 04:10 it was recorded flying up Upper Abbey track and at 04:19 it was back in Ash Wood where it remained until 04:40. It was then recorded in the woodland adjacent to Plantation Cottages at 04:57 and found in roost R19 during the following day search.

On 5 August the bat was recorded around Black Walks at 22:33-43 before moving to Ash Wood until at least 23:41. At 23:53 it was recorded flying into the Black Walks area and then over fields north-east of The Grove at 00:29. At 01:59 a single bearing placed the bat in the direction of Eastbridge but by 02:02 it had moved south to the woodlands around Leiston Old Abbey before heading back north to Black Walks at 02:35. At 03:10 it was recorded static in the Leiston Old Abbey Woods, although no specific tree roost was identified. It had left this area by 04:00 and was then recorded on Abbey Lane at 04:27. It returned to Leiston Old Abbey Woods at 04:30 and was located in R21 during the day.

On 6 August, it had left roost R21 by 21:27 and was then found moving south of Ash Wood at 21:55 and into Goose Hill by 23:06. It then moved rapidly back north and west to near the Round House by 23:12 before returning to Ash Wood between 23:22 and 23:39. It was then recorded along the northern edge of Kenton Hills at 00:58 but back in Ash Wood between 02:00 and 02:48 when it moved down to the Leiston Old Abbey woods and then around in a loop through Kenton Hills. This pattern continued with forays into Goose Hill followed by further activity around Black Walks and the woodland belt around Plantation Cottages and Lower

Abbey farm at 04:09. It was recorded roosting back in R21 in Leiston Old Abbey Woods on the following day.

On the evening of 7th August joint bearings were not prioritised on this bat. When monitored it was recorded in similar locations to the previous evenings, flying circuits between Black Walks, Ash Wood, Goose Hill and Leiston Old Abbey Woods with an occasional foray further east over the fields to the east of The Grove.

On 8 August it emerged early and was recorded flying within Leiston Old Abbey Wood from 20.40 (7 minutes after sunset). After visiting Ash Wood at 20:54 it flew down Abbey Lane towards Fiscal Policy, east into Kenton Hills and Goose Hill, all within a three minute period and then north through Hilltop Covert and Goose Hill towards the field systems east of The Grove. It then moved back into Goose Hill and through the western edge of the Grove between 21:21 and 21:30 and back into Goose Hill at 21:34. At 22:40 it was recorded north-west of Lower Abbey but no joint bearings were achieved. At 01:17 it was again in the north-west of Lower Abbey and the woodlands shown as England Covert and at 02:06 it was north-west of Eastbridge near the caravan park and static between 02:07 and 02:13. It remained in this area foraging in the woodlands and wetland around Chapel Road and Church Road until at least 02:47. It then moved back to the Black Walks area from 03:06 and Ash Wood before returning to Leiston Old Abbey Woods.

On the evening of 9th August the bat left the wood and headed up Abbey Lane at 21.10 before heading east and then north at 21:13. It flew rapidly north to the Minsmere Cut area and was recorded in Hangmans New Woods (in the RSPB reserve) and north and west along the sluice over the wet ditch network and carr woodland. It was recorded static in an unknown night roost to the north of Chapel Road and east of the caravan park. Most activity by this bat was recorded in this area north, west and south of Eastbridge between 22:05 and 00:48. The bat returned to the Leiston Old Abbey Woods to day roost.

On 10 August the bat returned to the area around Eastbridge where it had been recorded the previous evening between 23:01 (following emergence surveys of trees) to at least 01:37 when the surveyors focussed on other bats. It was still in the same area at 02:53 when it was subject to a spot check but at 03:08 the bat had moved back to the Black Walks area. The bat was recorded roosting in R17 on the following day.

Bat 14

This bat, a juvenile male, was caught from tree roost R9 on 3 August. A total of 55 joint bearings were achieved. Although no further single point estimates were plotted, the single point data was included in the text below. After capture it remained in Ash Wood for the majority of the night but it moved north and used roost R17 in the Lower Abbey area on 4 August. On the night of 4 August few joint bearings were taken but surveyors positioned monitoring the Ash Wood area recorded the bat in Ash Wood from 22:28 to 23.00. It was recorded back at Lower Abbey from 23:00 to 00:06 where for some of this time it was considered static and most likely back in roost R17. On 5th August during the daytime search it was found using tree roost R19.

On the night of 5 August between 21:30 and 22:23 it foraged around the area of Black Walks and Lower Abbey Farm using the various hedge and tree lines which radiate from the woodland at Plantation Cottages north towards Eastbridge and south into Black Walks. Thereafter spot checks positioned the bat in the same general area between 22:48 and 00:35. From 02:33 it appeared to be moving further north but then returned to the woodland around Plantation

Cottage and was recorded as static at 04:35. During the daytime search on 6th August the bat was recorded in tree roost R17.

On the night of 6 August the bat was recorded in the woodland around the Plantation Cottages and Black Walks as before. It then flew south at 21:52 between Ash Wood and Goose Hill before heading towards the Grove at 22:26. It was then lost and recorded again at 22:54 heading back north and was back in the woodland of Plantation Cottages at 22:59. It entered roost R19 and was recorded in that roost from 23:00 to 00:02. No further bearings were taken during the night as other bats were targeted. It was recorded static in one of the roost trees (R17 or R19) within the woodland adjacent to Plantation Cottages at 04:34. It was recorded during the day time using roost R17.

On the night of 7 August between 21:52 and 21:55 it was recorded flying in the woodland adjacent to the Plantation Cottages and into Black Walks. Other bats were then targeted for joint bearings and the area was left. Spot checks at 02:20 and 02:58 recorded the bat still in this area. At 03:20 the bat was at the eastern end of the woodland block before flying east towards Sandpytle Plantation and then returning to the Black Walks area from 03:30 until 04:16 when it was recorded static. During the daytime search on 8th August the bat was recorded in roost R17 again.

On the night of 8 August the bat appeared to follow the same pattern of flying within the woodlands around Plantation Cottages and into Black Walks with forays to the north in woodland spurs and fields north towards Eastbridge. At 21:46 the bat headed south and was recorded in Goose Hill and south of Ash Wood before it headed west towards the Upper Abbey Farm track. It then flew east between Ash Wood and the Grove and repeating the circuit around Ash Wood and Goose Hill before returning north to Black Walks by 22:08. It was recorded in the woodlands around Plantation Cottages and the area north and south of this from 22:44 to 23:03 when it flew south east. It was then reacquired in Ash Wood and flew between Ash Wood and the eastern side of Black Walks until 23:47. At 23:48 it was south of the Round House and completed a circuit back to Ash Wood. It appeared to stay in this general area between Ash Wood and the Round House between 00:30 and 00:48 until it flew south to the Leiston Old Abbey Woodlands where it remained between 00:59 and 01:45. Between 01:45 and 01:55 the bat flew in a large loop to the south west and then north east via Ash Wood then back to Abbey Wood at 01:55. It was recorded in this general area after this point and was static (likely in roost R21) at 03:41. The weather deteriorated and was raining with gusty rain and the bat was not recorded flying again. During the day the bat was in R21.

On the night of 9 August the bat was recorded flying within the Leiston Old Abbey woodland until 21:31 when it flew north to Black Walks and the woodland area around Plantation Cottages. It foraged in the Black Walks area and along the line of pines south to Ash Wood and as far north as Dovehill Plantation. It then appeared to head back south to the Leiston Old Abbey woodland and south into Kenton Hills as it could be picked up by a surveyor positioned in Reckham Pit Woods at 00:07. At 02:00 it was static in roost R21 and it was static during spot checks later on in the evening.

On the night of 10 August a similar pattern at the start of the evening occurred with the bat using the woodland area around Plantation Cottages and Black Walks and the line of pine trees south to Ash Wood. At 23:14 it was around Leiston Old Abbey Woods and the Kenton Hills area between 01:22 and 02:20, before moving into the Sizewell Belts immediately south of Fiscal Policy/Leiston Carr and the sewage works (at 03:00) before moving back to Sizewell Belts and Kenton Hills.

Bat 15

This bat, a juvenile male, was caught from tree roost R9 on 3 August. It was recorded flying in the area of Ash Wood at 02:51 and again at 04:02. It was last recorded at 04:50 as static in the north-east corner of Ash Wood. The bat was recorded in Ash Wood on the day of 4 August but during the night time tracking of 4 August, the bat was not recorded in Ash Wood. When other likely roost areas were checked (Ash Wood, Lower Abbey etc.) it was not recorded by the tracking team. At 05:07 Ash Wood was checked for a final time as was Lower Abbey Wood (R22) and Lower Abbey Farm (R17 and R20) and bat 15 was not found in these locations. On the morning of 5 August the bat was found grounded in long grass by brambles on the edge of the arable field beside the north-east corner of Ash Wood. It was in a weak condition and taken into care before being given water and mealworms but unfortunately died later that same day. It is possible that this bat had returned late back towards Ash Wood on the morning of 5 August but had failed to return to its roost and had become grounded. Extremely wet conditions with heavy downpours persisted through the whole of the day of 4 August and it is uncertain whether this contributed to its death.

Bat 16

This bat, a non-breeding female, was caught from tree roost R9 on 3 August. A total of 50 joint bearings and five single point estimates were recorded. The single point data has been analysed and the information from this added into the text below. The bat was recorded foraging widely through Goose Hill, and the arable fields between Goose Hill and Ash Wood, in and around The Grove north to Dovehill Plantation and west towards the Round House and Eastbridge. This bat was also found roosting in R17, R19 and R21.

On 3 August after release the bat was recorded in the Black Walks area from 02:55 onwards before moving east to the northern end of The Grove at 03:53. No further bearings were taken on that night. During the following day the bat was recorded in roost R17.

On 4 August the bat was recorded foraging between Ash Wood and The Grove between 23:03 and 00:02. Between 02:33 and 04:34 it flew between the woods at Plantation Cottages and Black Walks and Ash Wood. It was found roosting in tree R19 the following day.

On 5 August the bat was between the woodland around Plantation Cottages and Ash Wood from 21:45 and 22:07. It was then recorded north-west of the woodland at Plantation Cottages from 22:09 before heading back south. It was then in Goose Hill from 00:18 to 00:21 before returning to the Ash Wood area and then north to the woodland around Plantation Cottages. At 03:50 the bat was recorded back in the woodland area surrounding Plantation Cottages.

On 6 August, it was in the Black Walks area at 21:29, and then towards Goose Hill at 22:11. Occasional bearings were taken around the Ash Wood area before the bat was recorded back in Goose Hill from 00:22. At 04:12 the bat was recorded back in the woodland surrounding Plantation Cottages and was static in roost R17 from 04:34.

On 7 August the bat was again in Black Walks early in the evening before being recorded in Goose Hill from 22:42. It was recorded flying circuits around Goose Hill from 22:51 until 23:50. At midnight it was lost and found again between Goose Hill and Ash Wood at 01:30. It was back in the Black Walks/Plantation Cottage from 02:49 and considered to be static in either roost R17 or R19 until 03:49 when it was recorded flying in the woodland. The bat was found in R17 the following day.

On 8 August it was again flying in the woodlands adjacent to Plantation Cottages and Black Walks after emerging. It was recorded flying south from this area at 21:40 on the east side of Ash Wood. From 23:00 to 00:12 the bat was recorded flying circuits around Goose Hill. At 00:26 it was recorded to the north of Goose Hill and east of The Grove in the field system in this area before heading back south into Goose Hill. At 02:03 the bat was recorded static in a roost at Leiston Old Abbey Woods. The search the following day confirmed the bat in roost R21.

On 9 August only single bearing positions were taken. The bat was recorded flying within Leiston Old Abbey Woods from 21:00 and at 21:17 it was recorded flying rapidly in an easterly direction before returning back to the woods at 22:22 and then into Goose Hill and Hilltop Covert between 22:38 and 22:59. At 23:18 it was back at Leiston Old Abbey Woods with subsequent forays into Kenton Hills and to the north. It was then recorded briefly towards Greenhouse Plantation and further north near Black Walks at 23:51. At 02:31 the bat was recorded heading back into Leiston Old Abbey Woods and was recorded as static from 02:38.

On 10 August after the emergence surveys had been completed, it was recorded flying around Goose Hill, Sandlings Walk and the fields to the east of Goose Hill, when there was some wind and rain, between 23:21 and 01:15. It then moved north and west to Leiston Old Abbey Woods from 03:13 to 03:38 when it was recorded static in R21. At 03:57 it was in Leiston Old Abbey Woods then Ash Wood and back to Leiston Old Abbey Woods becoming static from 04:11. The following day the bat was recorded roosting in R21.

Bat 17

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 11 joint bearings were achieved with a further 16 single point estimates before the tag came off. The bat was recorded foraging widely over the belts south of Goose Hill, Leiston Old Abbey Woods, west to Greenhouse Plantation and north to Ash Wood. This bat was also found roosting in R17, R20, and R21. From 7 August the signal remained static in R21 suggesting that the tag had become dislodged.

After release the bat was recorded in the Kenton Hills area at 01:49 before heading north towards Ash Wood at 02:56. From 04:25 the bat was recorded in Goose Hill where it flew circuits down as far as Sandlings Walk and possibly over the fields to the east of Goose Hill. It was then recorded north at 04:53 near Ash Wood. On 4 August the bat roosted in R17 near the Plantation Cottages of Lower Abbey.

On the evening of 4 August it was recorded south of Goose Hill or Kenton Hills from 21:22, it was in the Sizewell Belts between Goose Hill and Grimseys during 21:29-44. At 23:46, 00:33, 02:04 and 02:25 it was recorded in or near Ash Wood. It was then recorded as around the woodlands adjacent to Plantation Cottages and Black Walks. It was recorded in the Kenton Hills area at 04:40 and at 04:48 it appeared to be static for a short period, most likely in a tree on the northern edge of Kenton Hills. At 05:14 it was recorded flying again on a bearing taking it towards the southern edge of Kenton Hills. During the daytime search it was found in roost R20 with bat 11.

On the evening of 5 August the bat moved about rapidly. It was recorded between Ash Wood and The Grove at 22:18 and 22:28 and then in the Ash Wood area at 23:33. It then flew down the Upper Abbey track and up and down the track in the woodland near Leiston Old Abbey at 00:54 before returning to Ash Wood at 01:02. It was then recorded at 01:34 to the west of the Site in Greenhouse Plantation and was recorded static for approximately 2 minutes at 01:47 before moving back towards Leiston Old Abbey Woods and then into Kenton Hills at 02:26. It

then flew eastwards to the corner of Hilltop Covert and Nursery Covert at 02:46. Between 03:25 and 03:49 the bat was recorded in the direction of Upper Abbey Barn and then towards the eastern side of Greenhouse Plantation before returning to Leiston Old Abbey Woods at 04:00. After this time it flew within Leiston Old Abbey woods then rapidly north towards Black Walks and returning to Leiston Old Abbey Woods where it finally settled at 04:44. The bat was recorded during the daytime search on 6 August in roost R21 in Leiston Old Abbey Woods. The following evening the tag remained in the tree roost so it was considered that it had become dislodged from the bat.

Bat 18

This bat, a juvenile female bat, was caught from tree roost R9 on 3 August. It used tree roost R17 during 4-11 August. A total of 75 joint bearings and five single point estimates were recorded. The bat was recorded widely between the Black Walks area using the strong line of pine trees leading south to Ash Wood, the south side of Sizewell Belts, Kenton Hills, Sandy Lane and Reckham Pits Wood.

After release on the night of 3 August the bat was recorded flying in The Grove at 02:17. The following day it was found roosting in roost R17 where it roosted every day after this point. On 4 August, the bat was recorded from 22:53 on in the Black Walks area and the woodland adjacent to Plantation Cottages and it is considered that the bat remained in the Black Walks area for most of the night.

On the night of 5 August, the bat was again recorded primarily around the Black Walks area and the woodlands adjacent to Plantation Cottages. At 22:07 the bat was recorded heading south out of Black Walks towards the Round House and did not return to the Black Walks area. It was then recorded to the south near Kenton Hills at 23:45. It was then recorded around the Ash Wood area before it moved to the Upper Abbey Track where it flew up and down the track for several minutes. It then flew on a direct path towards Hilltop Covert and Nursery Covert before returning to the Kenton Hills area and the fields immediately north of Kenton Hills and it remained in this area for some time. It was recorded back at R17 by 04:15.

On the night of 6 August it moved quickly south from the roost area and was recorded in the fields north of Kenton Hills and then into Kenton Hills at 21:31. It was positioned by joint bearings on the same hedgeline as it had been recorded using the previous evening at 01:07. After flying in the Kenton Hills area for some 15 minutes it moved south and was recorded flying in the Sizewell Belts for an hour, principally in the area south of Leiston Carr and later Reckham Pit Woods. It then flew north-east and was lost before being located in Goose Hill at 22:51 and briefly further north towards The Grove and Ash Wood at 22:56. From 23:00 to 23:05 it was recorded flying at the southern edge of Goose Hill and then between Goose Hill and Grimseys. From then it moved back into the Sizewell Belts/Leiston Carr area making forays into Nursery Covert at 00:45, the belts south of Goose Hill and Goose Hill. At 02:33 the bat was back Plantation Cottages where it remained for some 20 minutes, the bat was then lost heading towards the Minsmere reserve but no further bearings were achieved until the bat was located back in roost R17 at 03:54.

On 7 August the bat again headed quickly south from the roost area at 21:58. It was then followed into the Sizewell Belts area where it remained flying between the Belts, Fiscal Policy and the Kenton Hills area. It then moved south and was recorded foraging over Reckham Pit Woods, Leiston Common, south-east of Sandy Lane and over as far as Broom Covert between 22:50 and 00:50 after which point it headed north. It was found again north at Black Walks and

the woodland adjacent to Plantation Cottages from 02:03 where it remained for the rest of the evening foraging particularly in Black Walks.

On the night of 8 August, the bat again left the roost area quickly. Instead of heading south through Kenton Hills and into Sizewell belts in the west, it flew down through Black Walks at 21:17 and Goose Hill at 21:22. It appeared to forage in either the belts between Goose Hill and Grimseys or into the edge of Nursery Covert for a short period before moving to the south-west towards Reckham Pit Woods and south of Sandy Lane from 21:28. The bat remained in this area foraging widely over the woods in the area south of Sandy Lane and the field and ditch network over towards the Power Station, into Reckham Pit Woods and the ditch and field network north of this wood until 23:45. A short foray between 23:45 and 00:05 took it to the east of Ash Wood, back through Goose Hill and Nursery Covert. At 01:08 it headed back north and was recorded static at roost 17 from 01:30 and also at 02:43.

On the night of 9 August, a single surveyor monitored the location of the bat. It was recorded still within the roost area as late as 22:09 and headed south at approximately 22:17. As with previous nights the bat was recorded foraging in the Sandy Lane area, Broom Covert, Leiston Common and Reckham Pit Woods from 22:40 to 00:16 when the surveyor left the area.

On the night of 10 August, the bat had left the roost area by the time the emergence survey of the trees had been completed. It was found in the area around Sandy Lane and Reckham Pit Wood at 22:55 and it remained in this area foraging widely into Leiston Common and Sizewell Belts over to Leiston Carr as well as to the south-east of Sandy Lane. At 01:51 it was recorded in Kenton Hills and remained in this area and Nursery Covert until 02:25 before heading back into the belts south of Goose Hill and north of Grimseys and back to the Sandy Lane area where it remained until 03:00. At 03:04 it was recorded on a direct line back towards the roost area.

Bat 19

This bat, a juvenile male, was caught from tree roost R9 on 3 August. A total of 16 joint bearings and 5 single point estimates were recorded before the tag came off. It used tree roost R13, R19 and R21 from 4-6 August. After that point the signal was confirmed as static from R21 and the tag was believed to have been dislodged. The bat was recorded foraging around Ash Wood, Lower Abbey Woods and Sandypytte Plantation.

After release it was recorded in Ash Wood and on the following day it was tracked to roost R13 on the west side of the wood. On the night of 4 August the bat was recorded flying within Ash Wood at 21:47. Spot checks were made through the night and it was recorded in the general Ash Wood area until 02:25. At 03:31 the bat was recorded in the north and was recorded flying within the woodland adjacent to Plantation Cottages and Black Walks. The following day it was found roosting in tree R19.

On the night of 5 August the bat was recorded foraging in the Black Walks area and the woodlands surrounding Plantation Cottages, as far south as the Round House and Ash Wood and west beyond Eastbridge Road. It was also recorded flying to the north-east towards Sandypytte Plantation before returning to the Black Walks area. It then headed south towards the Upper Abbey Farm area and in the fields north of Leiston Old Abbey woods at 00:24 before returning north to the woodland at Plantation Cottages where it was recorded static for a period at 01:34 in R19. It was then recorded back in Leiston Old Abbey Wood and the fields to the north from 02:58 and was recorded static in the woodland at 04:00.

Bat 20

This bat, a post-lactating female, was caught from tree roost R9 on 3 August. A total of 17 joint bearings and 10 single point estimates were recorded. The bat used roosts R18 and R17. From 7 August the signal remained static in R17 suggesting that the tag had become dislodged. The bat was recorded foraging in the Sizewell Belts area, Ash Wood and Kenton Hills.

After release the bat was recorded in Goose Hill at 01:51. The bat was then recorded on a south-easterly bearing from the junction of Fiscal Policy and Lover's Lane. It was recorded in roost R18 on the southern side of Kenton hills during the day search of 4 August.

On the evening of 4 August a surveyor on the sea wall positioned the bat flying north-east through Goose Hill towards Ash Wood at 21:10 and at Ash Wood at 21:28. It was recorded again at 23:04 in the direction of Ash Wood but was then recorded to the west towards Upper Abbey Track at 00:34 before returning to Ash Wood and heading south into Nursery Covert at 01:41. It was not recorded after this point until it was reacquired to the south in either Leiston Common or Sizewell Belts at 02:57. It was next recorded in the north around the Black Walks area at 04:00 and it was found roosting in tree R17 the following day.

On the night of 6 August the bat was recorded leaving the roosting area relatively early and was found flying up and down the Upper Abbey track at 21:18. The bat then flew eastwards to the south of Ash Wood. It was then recorded at 22:36 in the direction of Goose Hill before it moved south into the Sizewell Belts area and south of Sandy Lane. It was then recorded to the south of Kenton Hills in the Sizewell Belts area and towards Reckham Pits Wood and it remained in this area flying between this area and the Grimseys area until at least 02:27. The bat was recorded to the west of Kenton Hills briefly at 03:05 before being recorded at Black Walks at 04:28. It returned to roost R17 after which point the tag appears to have come off the bat in the roost as it was not recorded moving after this point.

Movements of Other Species of Tagged Bats

Bat 1 – Natterer's Bat

This bat, a post lactating female Natterer's bat, was caught at 22:25 on 31 July at Turf Pits (T2). A total of 17 joint bearings were achieved with a further 13 single point estimates before the tag failed. It was recorded roosting within Leiston Abbey ruins between 31st July and 7th August after which point the tag battery expired.

During the radio-tracking the key foraging area for this bat appeared to be the sewage works and adjacent fields/ditch network to the south and west of Lover's Lane. On 31st July it was recorded in this area between 22:58 and 00:33 and again on 2nd August between 01:36 and 02:50. After this point, records were made by single bearings to confirm that the bat was in this area. If it was recorded in other areas joint bearings were attempted. The bat was principally recorded foraging in the Lover's Lane area, on the night of 3rd August. Spot checks between 01:39 and 03:20 put the bat in the sewage works area and then moving to the north-east into the Fiscal Policy area. Similarly on night of 4th August spot checks put it in the sewage works area during the middle of the night and at 02:28 moving into the Fiscal Policy area. This pattern continued on the 5th and 6th August before the tag failed.

Bat 2 - Natterer's Bat

This bat, a post lactating female Natterer's bat, was caught at 23.45 on 30 July in a mist net at Fiscal Policy (T1). A total of 12 joint bearings and six single point estimates were recorded

before the tag came off the bat. It was recorded foraging in the Fiscal Policy area as well as around the sewage works and adjacent fields/ditch network to the south and west of Lover's Lane.

No bearings were taken on this bat on night of 1st August as most survey effort was being made on getting joint bearings of bats 3 to 8. The tag was found on the ground in the Fiscal Policy woodland area during the daytime roost search on 2nd August 2011, suggesting the tag had been lost some time during the night of 1st August.

Bat 4 – Brown Long-eared Bat

This bat, a post lactating female, was caught at the south-west corner of Goose Hill (T2) on 31 July at 01:45. The bat used an unknown roost site in Rookyard Wood south of Sandy Lane and then used Roost RC in a house south of Sizewell for the rest of the tracking period. The bat was recorded foraging in the following areas: Goose Hill, Kenton Hills/Nursery Covert, Broom Covert, Reckham Pitts Wood, the northern Sizewell Belts and Grimseys.

On 1 August the roost site was not found but joint bearings put it in the Rookyard Wood area south of Sandy Lane and west of the power station. In the evening it was first recorded flying north of the roost area at 21:43. By 21:58 the bat was in the southern reaches of Goose Hill before moving into Nursery Covert where it was regularly recorded until 00:30 when it moved south. It was then recorded around the Sandy Lane area.

On 2 August the bat was recorded roosting in roost RC in a house to the south of Sizewell. The bat continued to use this roost on each day for the remainder of the tracking period. On the night of 2 August, the bat was recorded in the Goose Hill and Nursery Coverts area from 22:07 and was recorded to the south of the Sandlings Walk area until 23:26. At 03:18 the bat was recorded flying through Goose Hill.

No bearings were taken on the night of 3 August as radio-tracking concentrated on barbastelle bats. On 4 August it was recorded in the Goose Hill area from 21:47 and was recorded foraging in this area constantly from 22:13-38. On 5 August three bearings were achieved, at 22:05, 22:38 and 23:36, all from the direction of Reckham Pitts Wood and Grimseys.

On 6 August 2011, it was to the south-east of Reckham Pitts Wood at 22:00. At 22:15 the bat was recorded in the Sizewell Belts area to the south of Goose Hill where it was again confirmed at 22:52. From 23:10-18 the bat was recording foraging along the northern side of Kenton Hills. It then moved south-east to forage over the Sizewell Belts area between Goose Hill and Grimseys from 23:06-18. The bat drifted south-eastwards and from 23:20-26 was tracked to the Sizewell Belts area south of Goose Hill near Grimseys and at the far eastern end of Sandy Lane. From 00:05 through 00:21 it was recorded again foraging in a similar area over the Sizewell Belts along the northern edge of Grimseys. At 02:22 the bat was detected faintly in the direction of its roost site at Sizewell Hall and was not re-acquired within the Site for the remainder of the night.

On 7 August 2011, the bat was detected near Roost RC at 21:32 and again at 22:40. At 00:06 it was tracked south of Sandy Lane over Broom Covert which was a new foraging area used by this bat. On 8 August 2011 the bat was first acquired at 00:06 when it was again foraging in the area of Broom Covert to the south of Sandy Lane. From 00:10 the bat started to drift south and east back towards its roost site at Sizewell Hall. Regular checks were made confirming that the bat was foraging in the general region between Broom Covert and Sizewell Common until 01:36 when it was confirmed as far as east as Coronation Wood. On 9 August 2011 the bat was

confirmed as static at its Sizewell Hall roost (RC) at 22:40 and the tag was thought to have been dislodged in the roost.

Bat 21 - Natterer's Bat

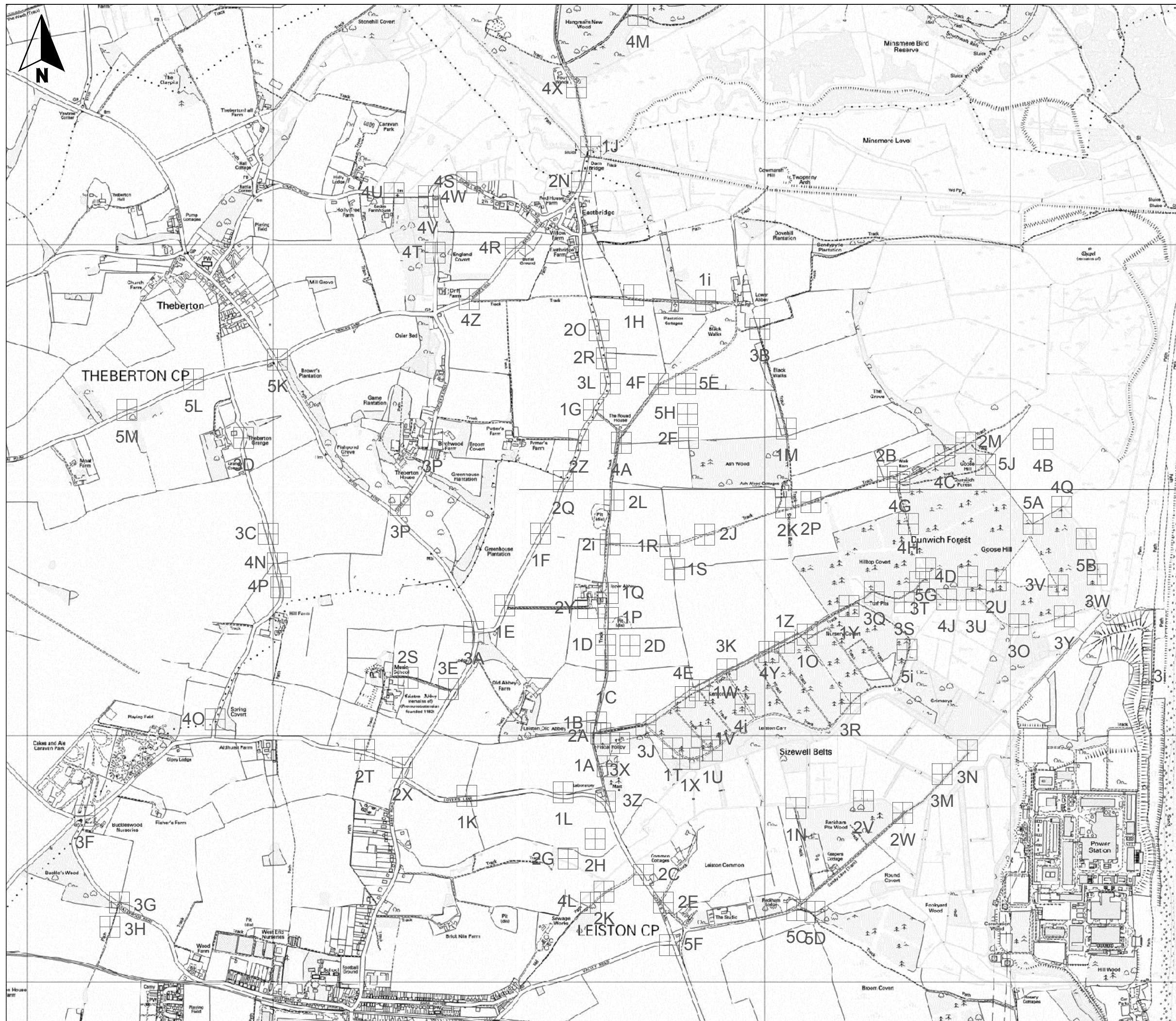
Bat 21, a breeding female Natterer's bat, was caught at the southern end of The Grove (T4) at 02:15 on 4 August. Thirty-five joint bearings were achieved. In comparison with barbastelles, the area the bat was recorded in was much more restricted. The principal areas for foraging were around Goose Hill and The Grove and the open areas near Walk Barn.

The bat roosted in two tree roosts RE in Sandpytyle Plantation and RF on the eastern side of The Grove. Emergence surveys of both trees were undertaken using Sony camcorders with Nightshot vision and with the radio-tracking receivers being used with headphones to work out when the bat was stirring within the tree and then flying. No bats were seen emerging from either tree.

Bat 22 - Natterer's Bat

Bat 22, a non-breeding female Natterer's bat was at The Grove (T4) at 03:15 on 4 August. Sixteen joint bearings and eight single point estimates were recorded. During the day the bat roosted in a bat box on a tree in Kenton Hills (RD). It was recorded foraging principally in the Goose Hill and Walk Barns area.

The Natterer's bats appeared to be active later than the barbastelle bats and this bat stayed close to the bat box for a while before moving over to the Goose Hill area. For example, on 9 August the bat was recorded foraging in Kenton Hills during 21:26-33 and then flew in a north-easterly direction away from the roost area. The bat generally appeared to stay in the foraging area throughout the night leaving the foraging area for example at 04.04 and being confirmed back in the bat box by 04:20. Although no joint bearings were achieved in the Ash Wood area it would appear from single bearings that the bat did fly towards the wood on occasions.



KEY



Vantage point 2V



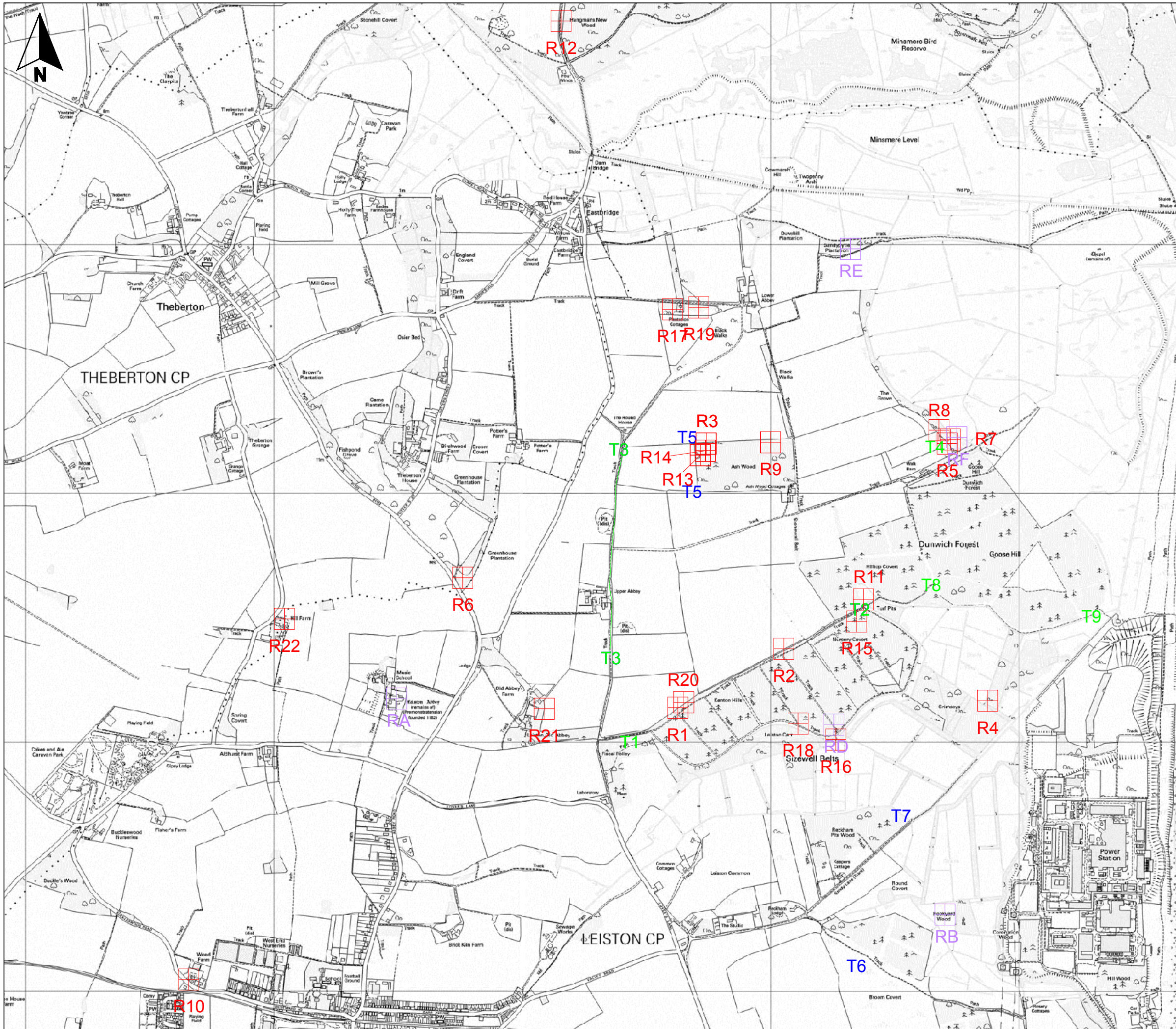
Sizewell Bat Report 2011

Figure C1
Vantage points

January 2012
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- KEY**
- R14 Barbastelle roosts R1-R22
 - RA Roosts of other species
 - T1 Trapping location - used in 2011
 - T7 Trapping location - used 2010 only



Sizerwell Bat Report 2011

Figure C2
Roosts 2010/2011 and trapping locations 2011

January 2012
28130_A244.dwg tugwc



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Sizewell Bat Report 2011

Figure C3a
Barbastelle Roost Photographs



Sizewell Bat Report 2011

**Figure C3b
Barbastelle Roost Photographs**

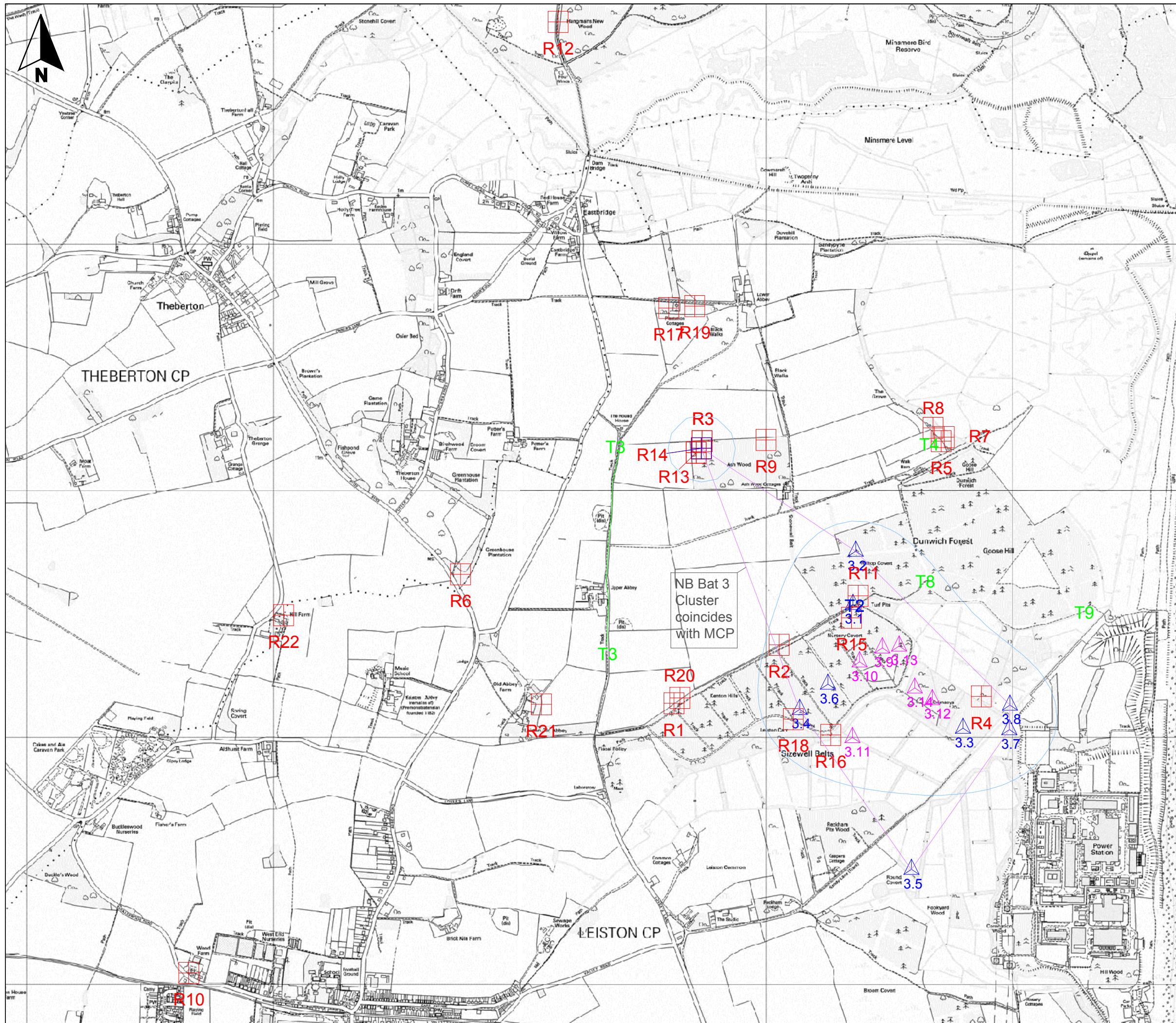


Sizewell Bat Report 2011

**Figure C3c
Barbastelle Roost Photographs**

January 2012
28130-A330.ai squij





- KEY**
- R9 Roost 9
 - R14 Roost 14 - used by bat 3
 - T2 Mist net/harp trap trapping location 2 - bat 3 caught here
 - ▲ 3.1 Bat 3 joint bearing triangulation point 1
 - ▲ 3.10 Bat 3 additional point 10
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



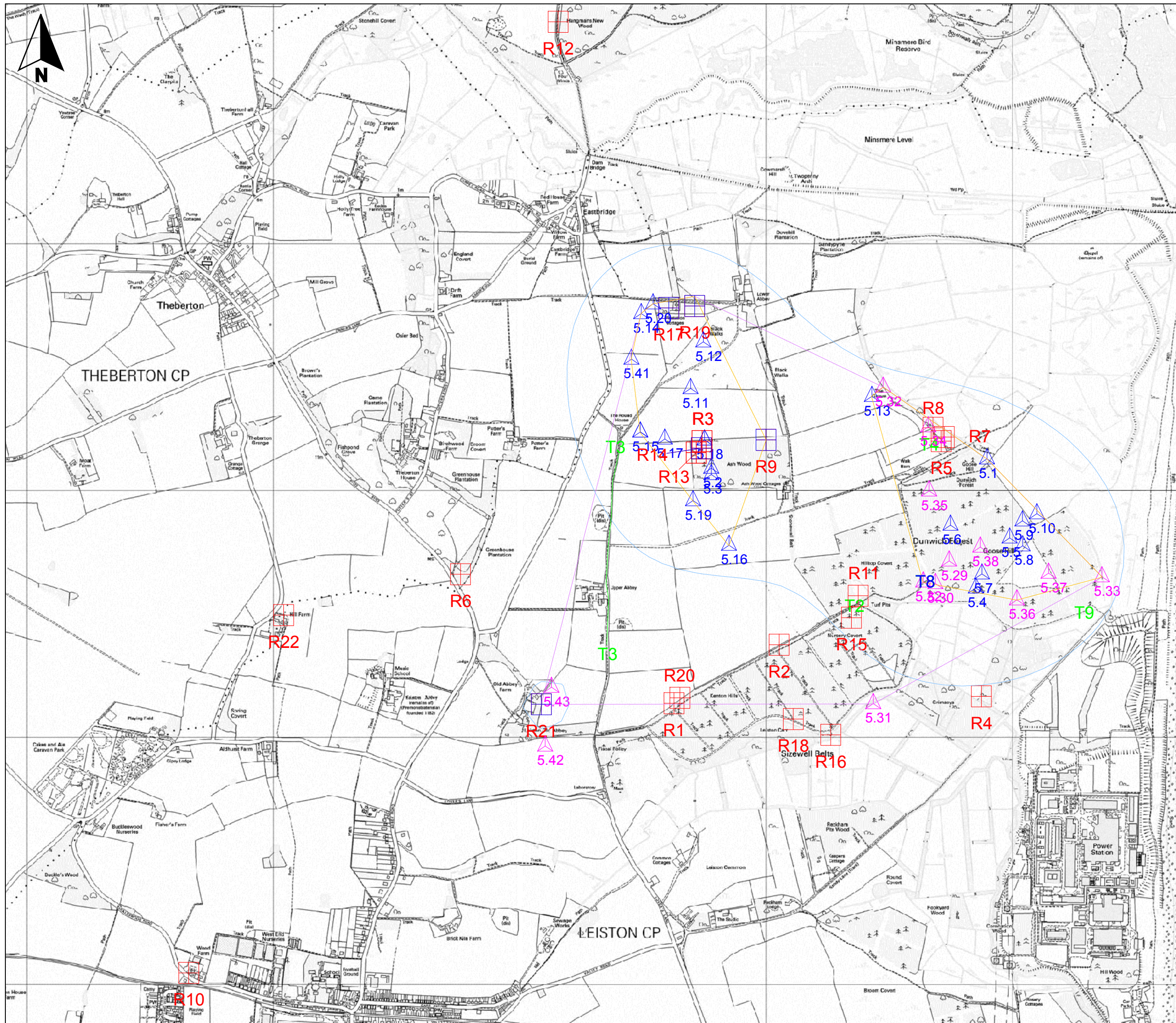
Sizewell Bat Report 2011









Figure C4
Bat 3 - non-breeding female
barbastelle - triangulation points

January 2012
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- KEY**
-  Roost 5
 -  Roost 17 - used by bat 5
 -  Mist net/harp trap trapping location 8 - bat 5 caught here
 -  Bat 5 joint bearing triangulation point 13
 -  Bat 5 additional point 33
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



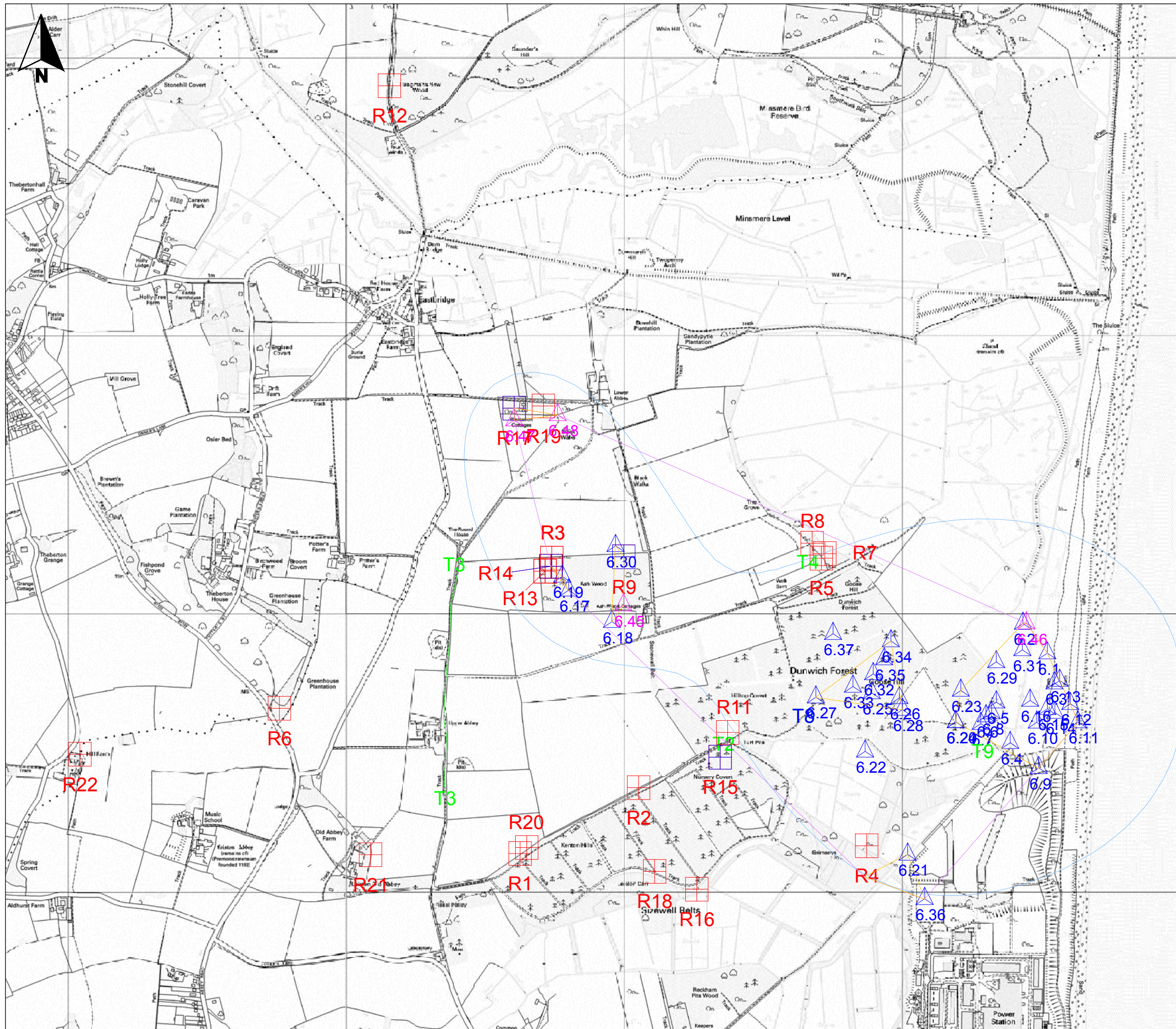
Sizewell Bat Report 2011

Figure C5
Bat 5 - juvenile male barbastelle -
triangulation points

January 2012
28130_A246.dwg tugwc



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- KEY**
- R5 Roost 5
 - R9 Roost 9 - used by bat 6
 - T8 Mist net/harp trap trapping location 8 - bat 6 caught here
 - ▲ 6.42 Bat 6 joint bearing triangulation point 42
 - ▲ 6.45 Bat 6 additional point 45
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



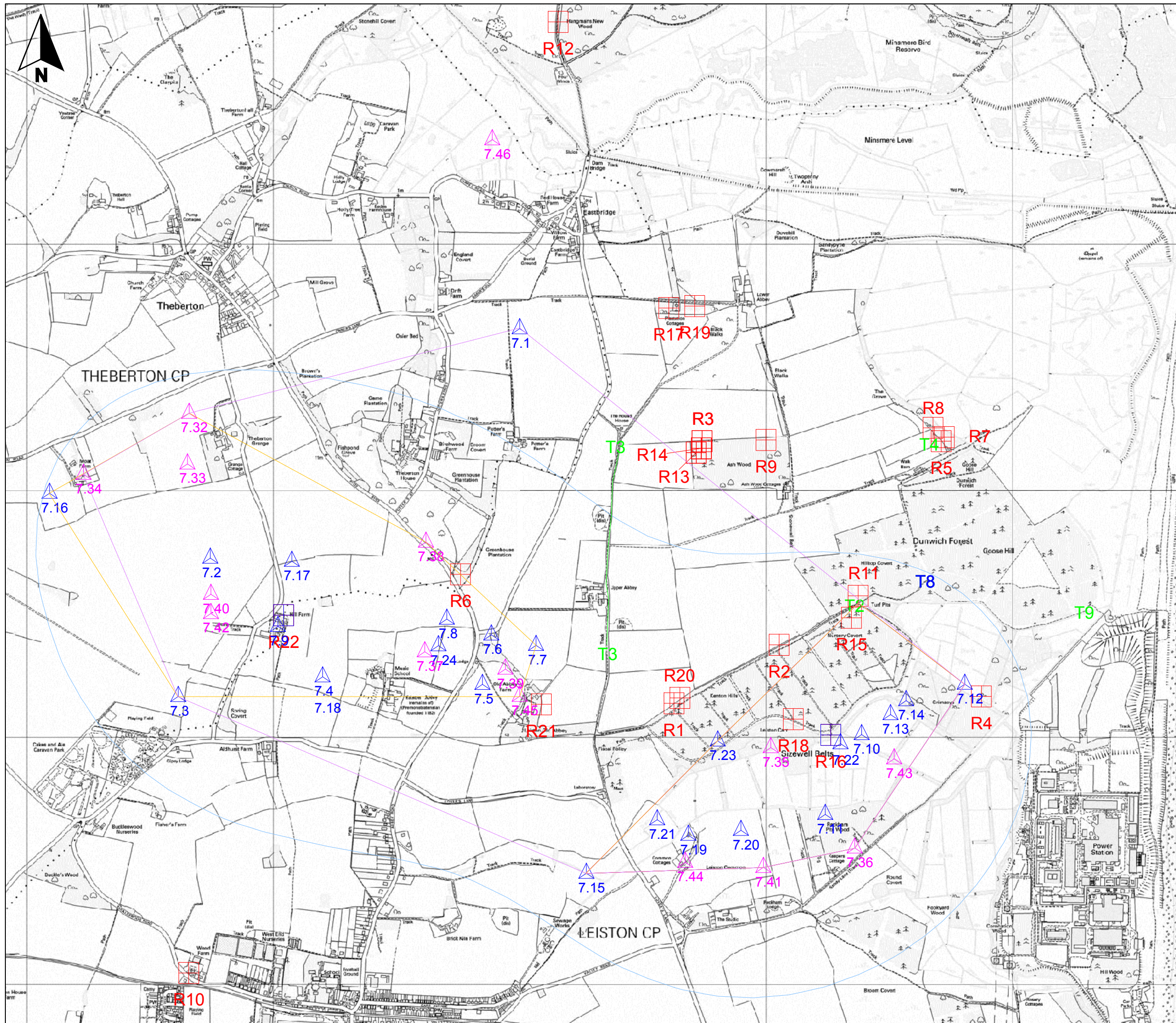
Sizewell Bat Report 2011

Figure C6
Bat 6 - breeding female
barbastelle - triangulation points

January 2012
 28130_A247.dwg tugwc



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- KEY**
- R5 Roost 5
 - R22 Roost 22 - used by bat 7
 - T8 Mist net/harp trap trapping location 8 - bat 7 caught here
 - ▲ Bat 7 joint bearing triangulation point 2
 - ▲ Bat 7 additional point 46
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



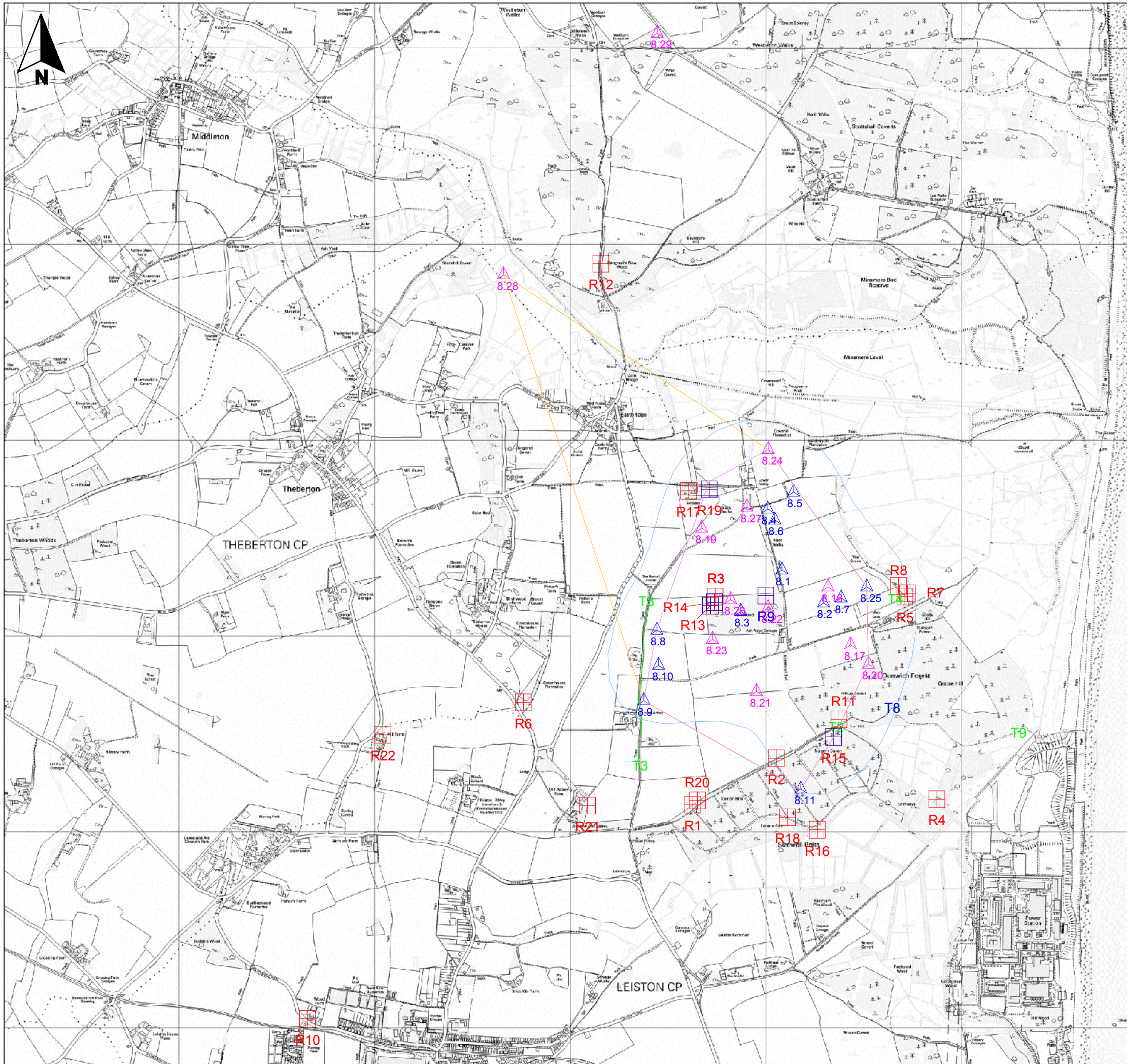
Sizerhall Bat Report 2011









Figure C7
Bat 7 - non-breeding male
barabastelle - triangulation points

January 2012
 28130_A248.dwg tugwc



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- KEY**
-  Roost 5
 -  Roost 15 - used by bat 8
 -  Mist net/harp trap trapping location 8 - bat 8 caught here
 -  Bat 8 joint bearing triangulation point 2
 -  Bat 8 additional point 17
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis

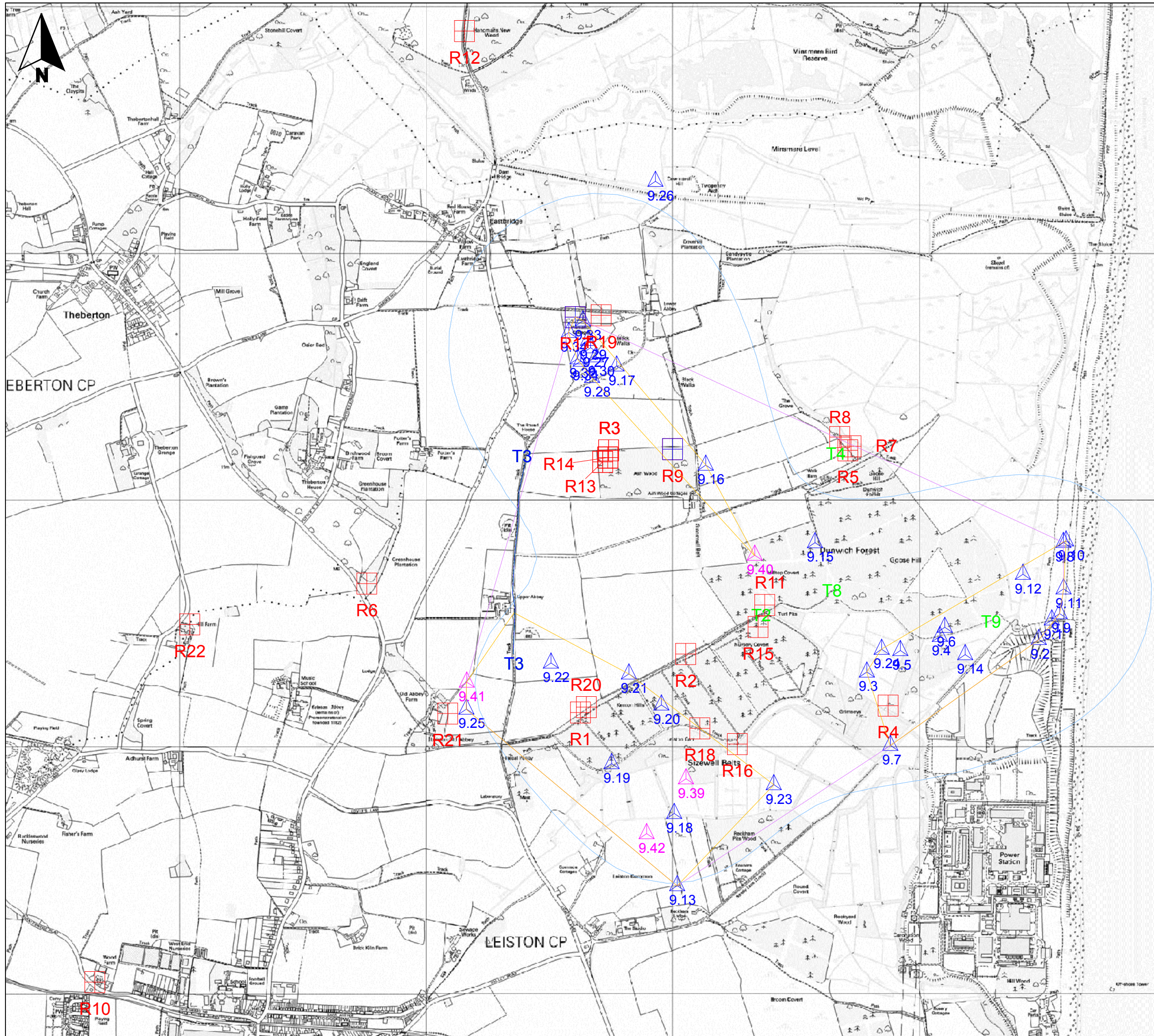


Sizewell Bat Report 2011

Figure C8
Bat 8 - breeding female
barbastelle - triangulation points

January 2012
 28130_A249.dwg tugwc





- KEY**
- Roost 5
 - Roost 9 - used by bat 9
 - Mist net/harp trap trapping location 3 - bat 9 caught here
 - Bat 9 joint bearing triangulation point 2
 - Bat 9 additional point 40
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



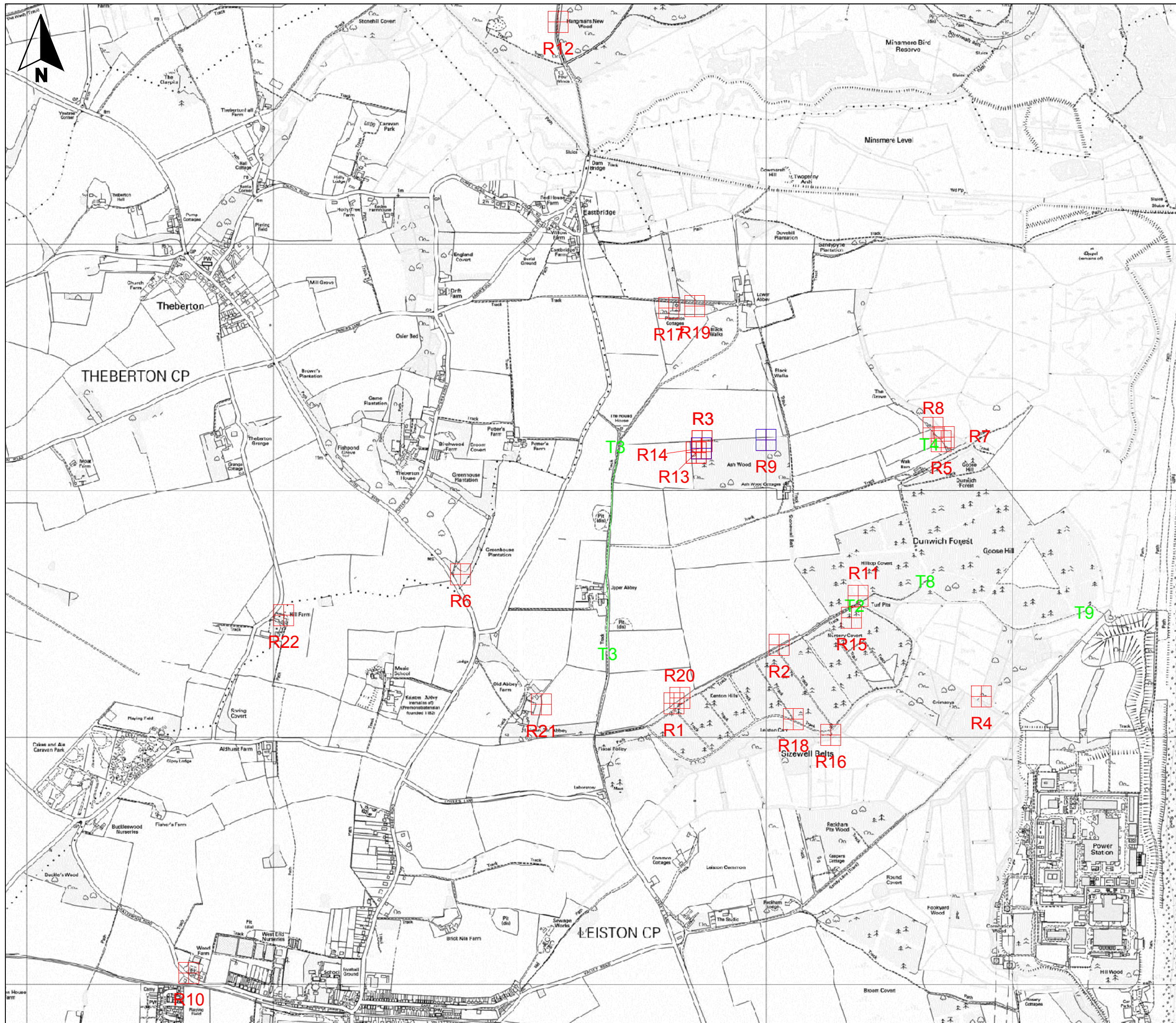
Sizewell Bat Report 2011

Figure C9
Bat 9 - breeding female
barbastelle - triangulation points

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 28130_A250.dwg tugwc



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- KEY
- R5 Roost 5
 - R9 Roost 9 - used by bat 10
 - T2 Mist net/harp trap trapping location 2



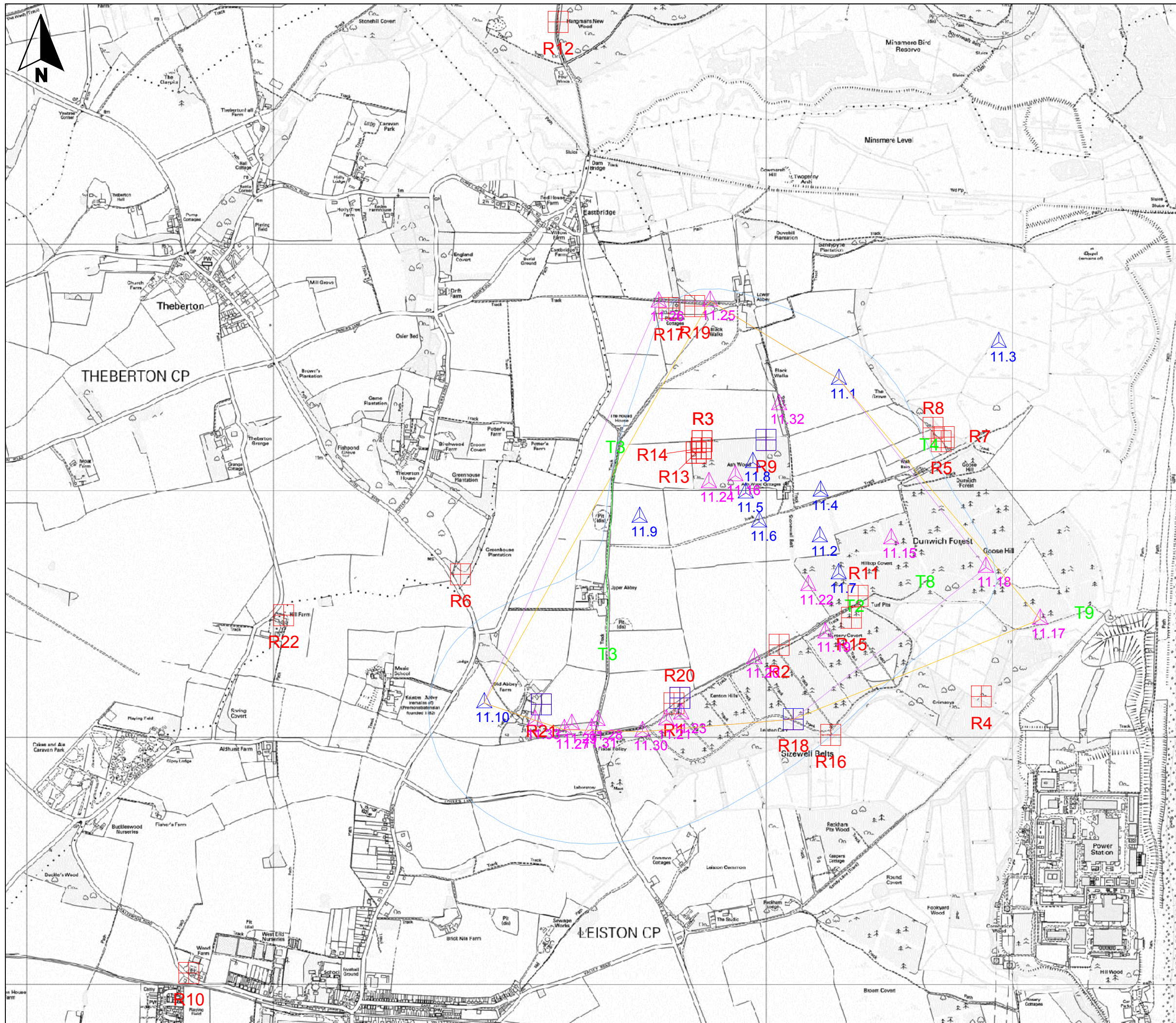
Sizewell Bat Report 2011

Figure C10
Bat 10 - juvenile male barbastelle
- roosts used

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 28130_A251.dwg tugwc



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- KEY**
- Roost 5
 - Roost 20 - used by bat 11
 - Mist net/harp trap trapping location 2
 - ▲ Bat 11 joint bearing triangulation point 2
 - ▲ Bat 11 additional point 24
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



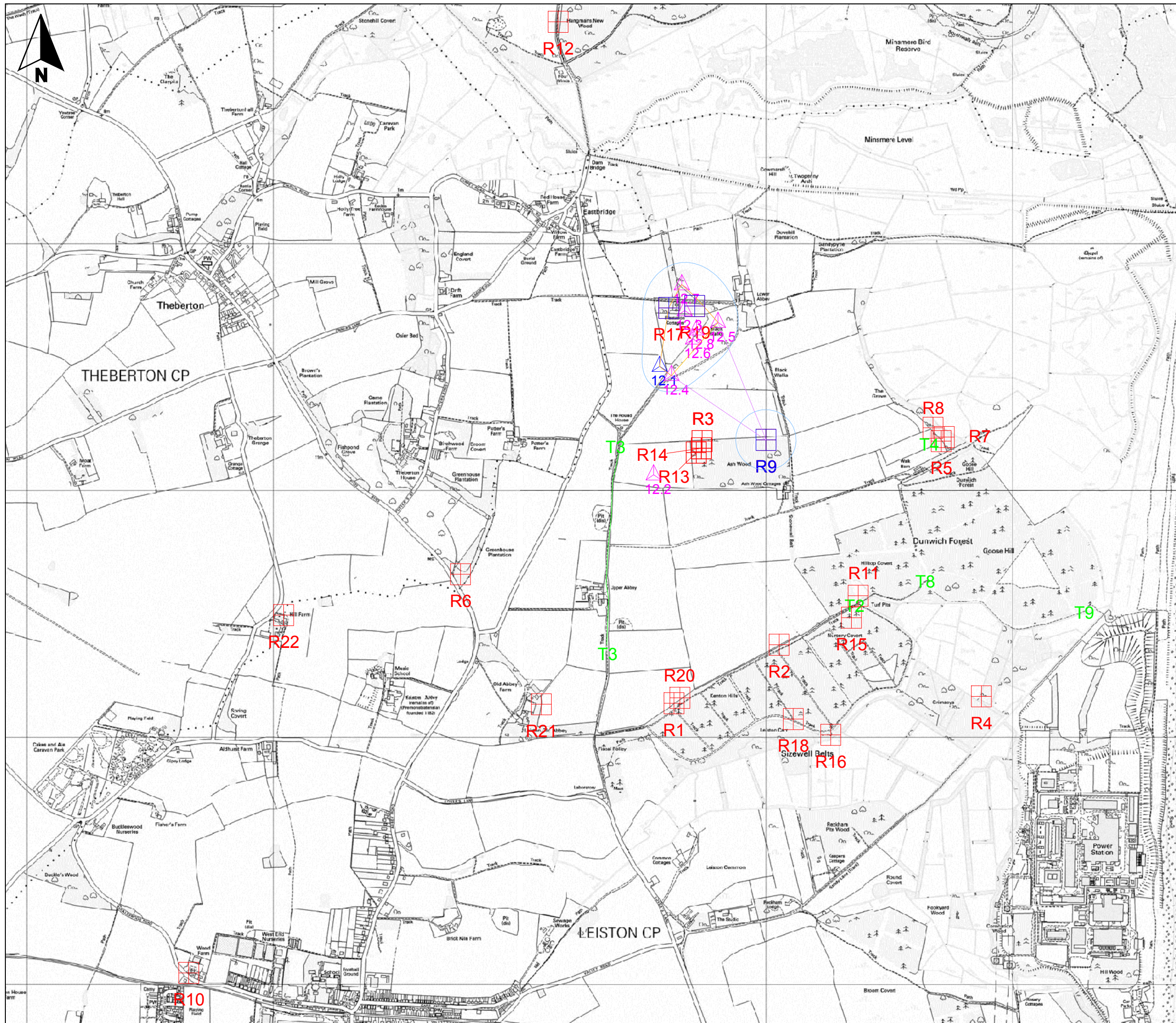
Sizewell Bat Report 2011









Figure C11
Bat 11 - breeding female
barbastelle - triangulation points

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 28130_A252.dwg tugwc



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- KEY**
-  Roost 5
 -  Roost 9 - used by bat 12
 -  Mist net/harp trap trapping location 2
 -  Bat 12 joint bearing triangulation point 2
 -  Bat 12 additional point 4
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



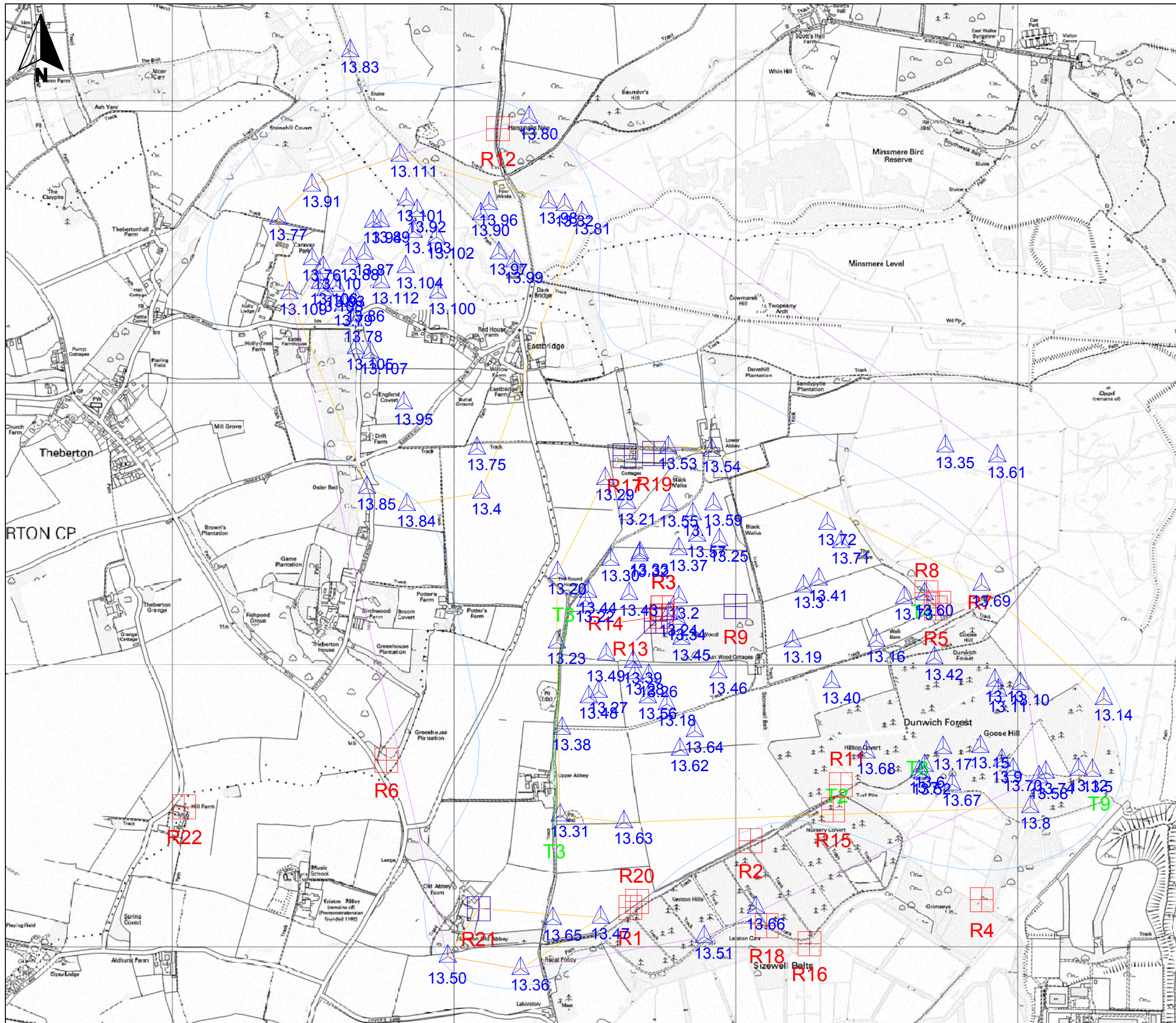
Sizewell Bat Report 2011

Figure C12
Bat 12 - juvenile male barbastelle -
triangulation points

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- KEY**
- R5 Roost 5
 - R21 Roost 21 - used by bat 13
 - T2 Mist net/harp trap trapping location 2
 - ▲ Bat 13 joint bearing triangulation point 2
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



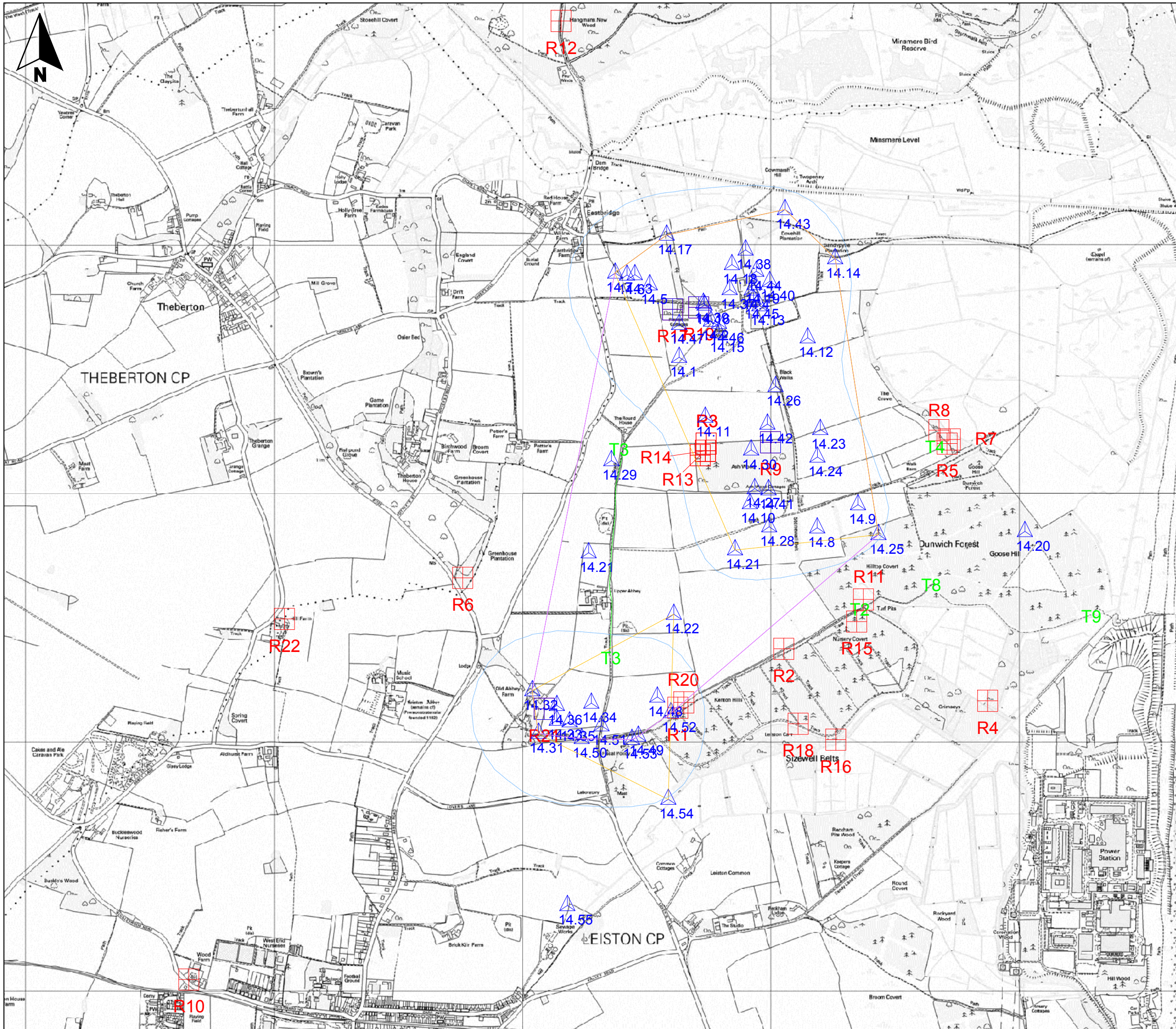
Sizewell Bat Report 2011








Figure C13
Bat 13 - breeding female
barbastelle - triangulation points

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 28130_A254.dwg tugwc



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- KEY**
-  Roost 5
 -  Roost 17 - used by bat 14
 -  Mist net/harp trap trapping location 2
 -  Bat 14 joint bearing triangulation point 2
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



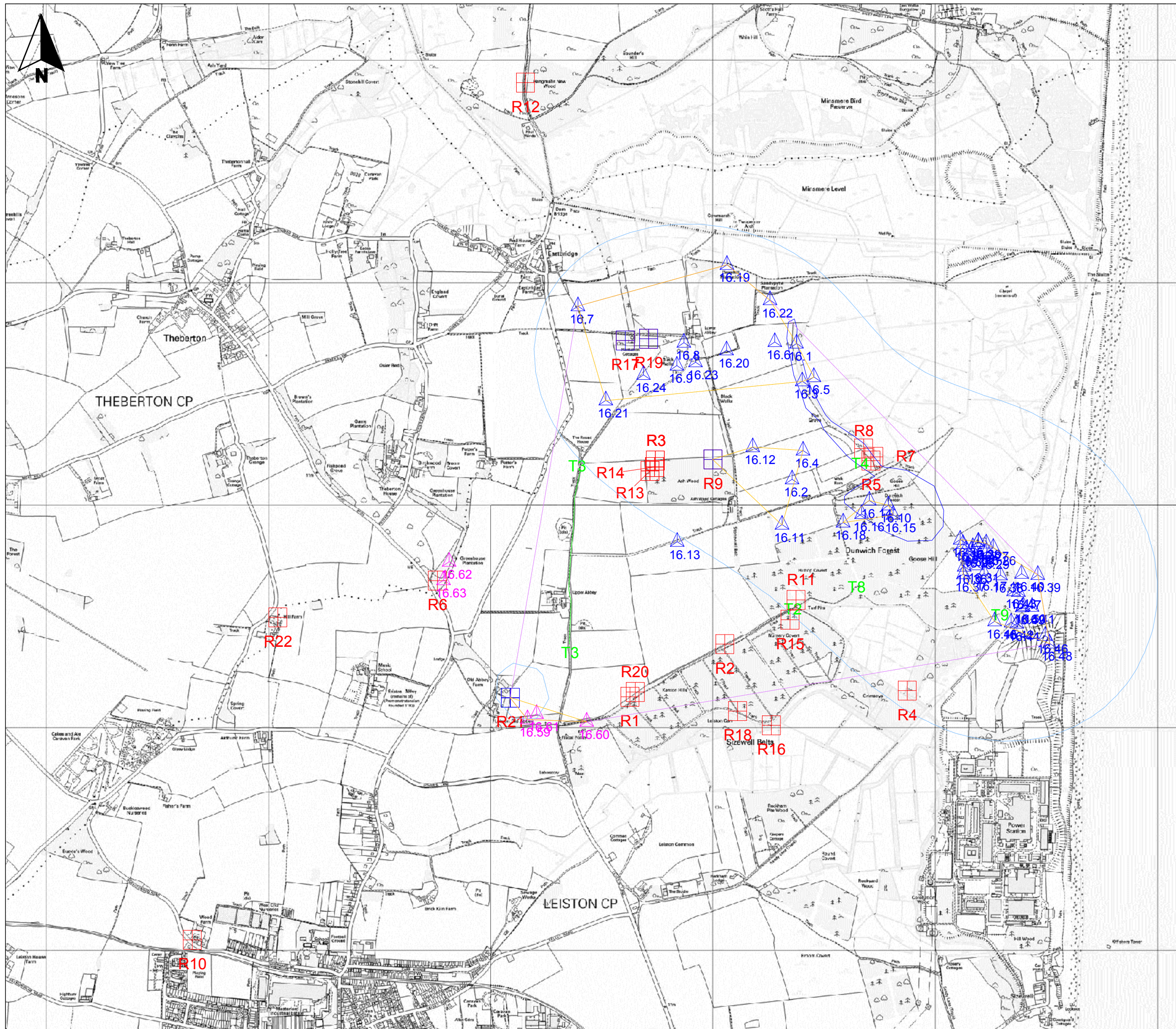
Sizewell Bat Report 2011

Figure C14
Bat 14 - juvenile male barbastelle - triangulation points

January 2012
28130_A255.dwg tugwc



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- KEY**
- Roost 5
 - Roost 17 - used by bat 16
 - Mist net/harp trap trapping location 2
 - Bat 16 joint bearing triangulation point 2
 - Bat 16 additional point 60
 - Close tracking area
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis

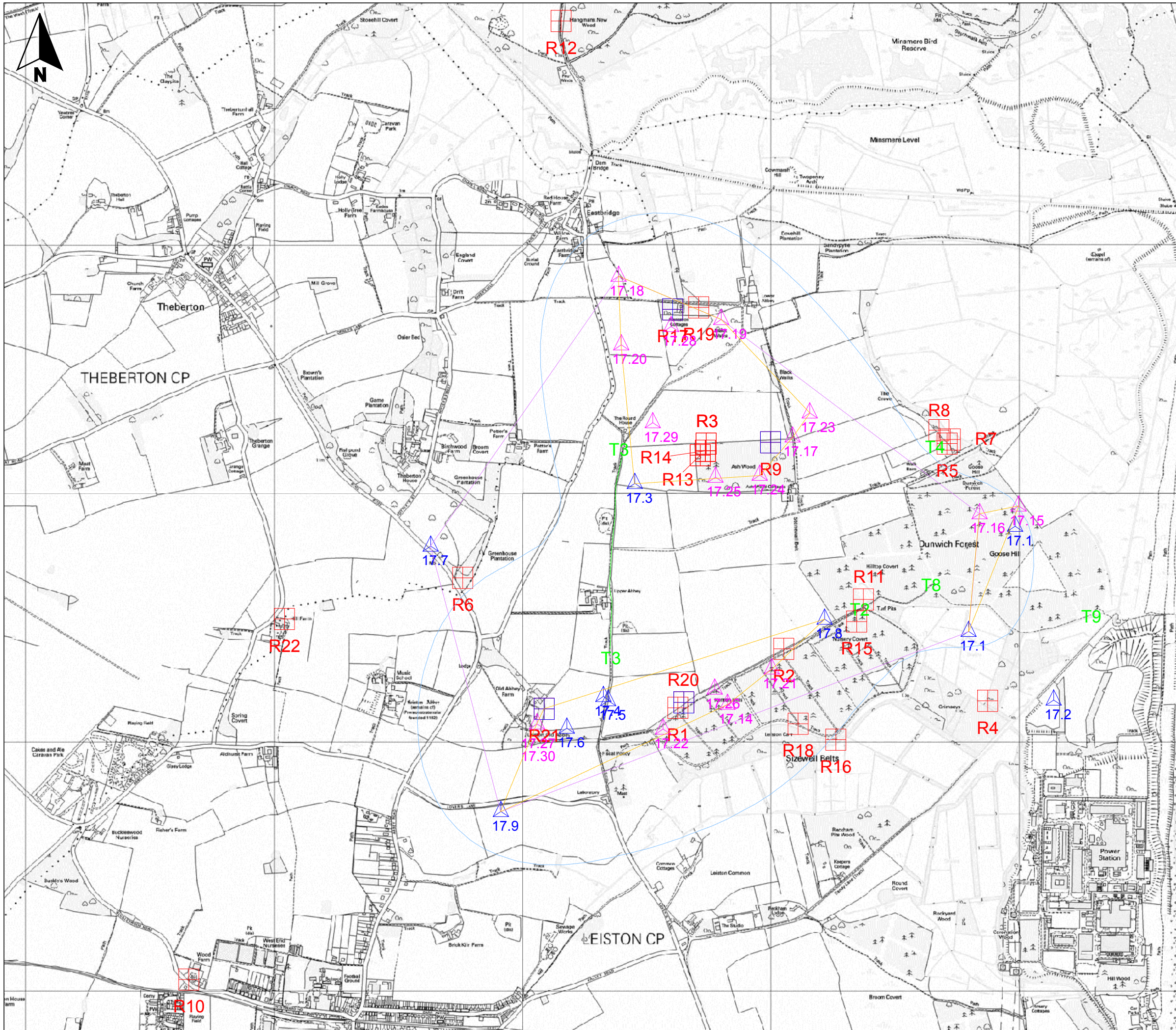


Sizewell Bat Report 2011

Figure C15
Bat 16 - non-breeding female
barbastelle - triangulation points



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- KEY**
- Roost 5
 - Roost 21 - used by bat 17
 - Mist net/harp trap trapping location 2
 - Bat 17 joint bearing triangulation point 2
 - Bat 17 additional point 23
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



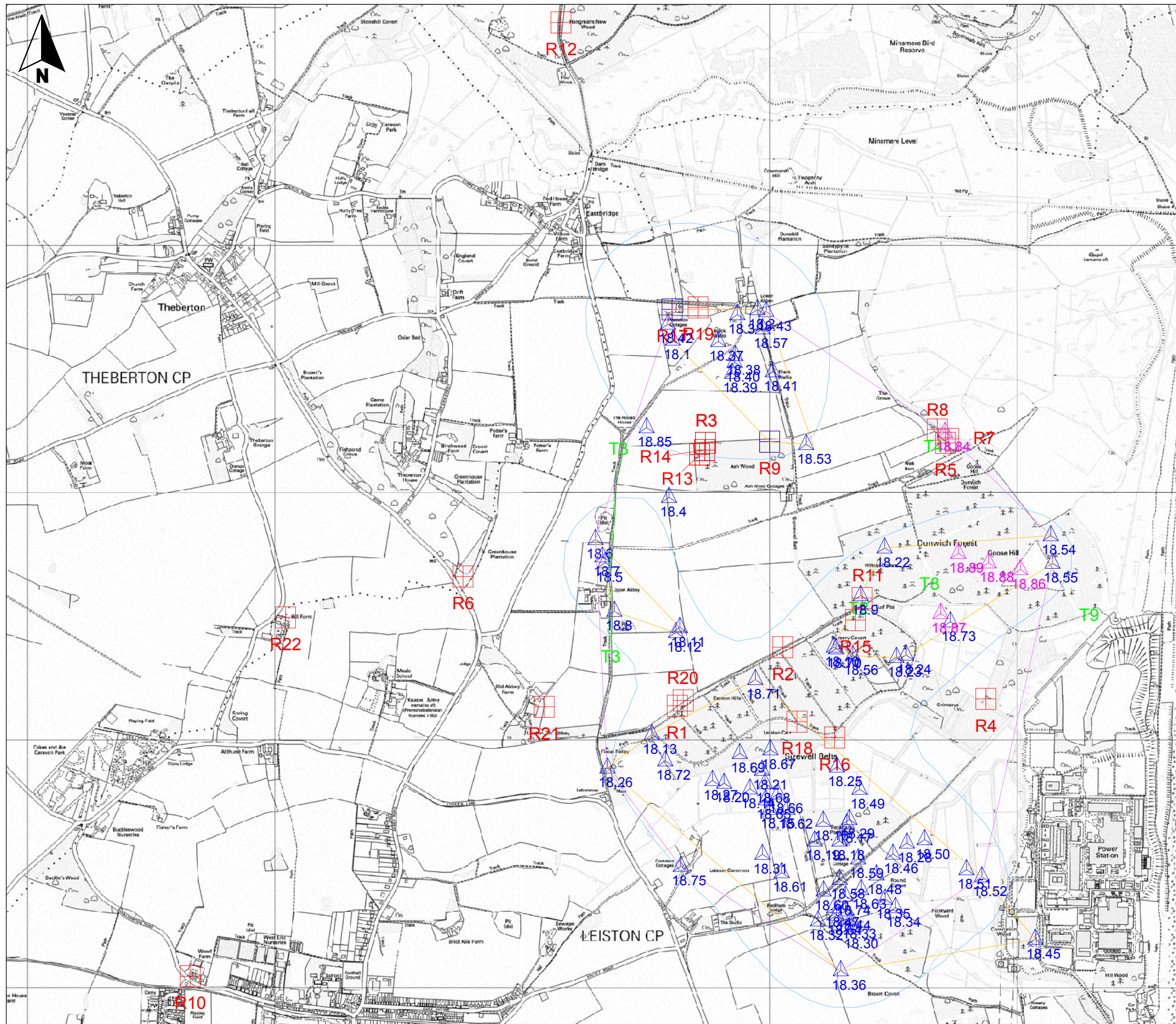
Sizewell Bat Report 2011

Figure C16
Bat 17 - breeding female
barbastelle - triangulation points

January 2012
 28130_A257.dwg tugwc



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- KEY**
- Roost 5
 - Roost 17 - used by bat 18
 - T2
 - ▲ Bat 18 joint bearing triangulation point 2
 - ▲ Bat 18 additional point 89
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



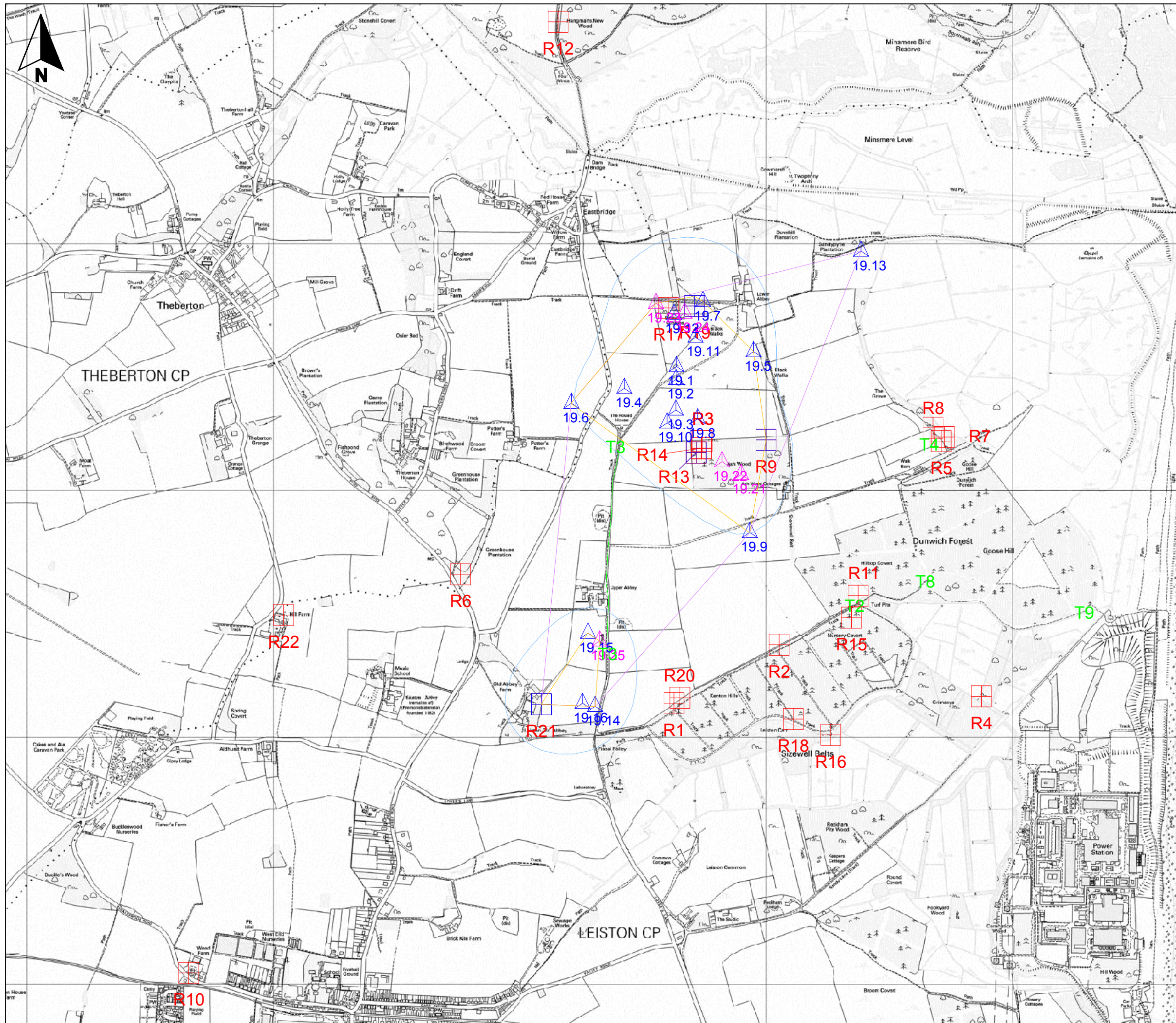
Sizewell Bat Report 2011









Figure C17
Bat 18 - juvenile female
barbastelle - triangulation points

January 2012
 28130_A258.dwg tugwc



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- KEY**
-  Roost 5
 -  Roost 21 - used by bat 19
 -  Mist net/harp trap trapping location 2
 -  Bat 19 joint bearing triangulation point 2
 -  Bat 19 additional point 22
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



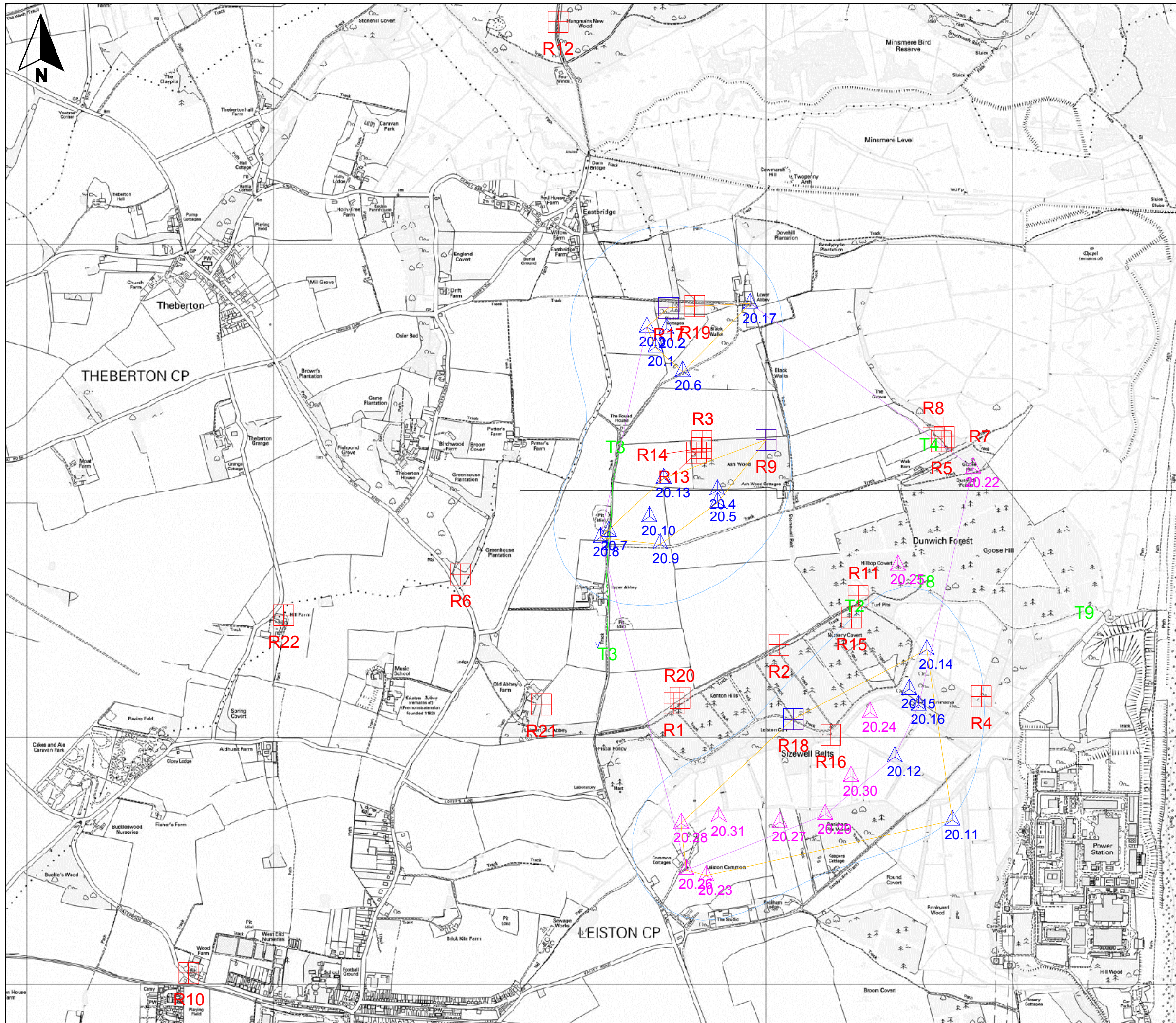
Sizewell Bat Report 2011

Figure C18
Bat 19 - juvenile male
barbastelle - triangulation points

January 2012
 28130_A259.dwg tugwc



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- KEY**
- R5 Roost 5
 - R18 Roost 18 - used by bat 20
 - T2 Mist net/harp trap trapping location 2
 - ▲ 20.2 Bat 20 joint bearing triangulation point 2
 - ▲ 20.22 Bat 20 joint bearing triangulation point 22
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



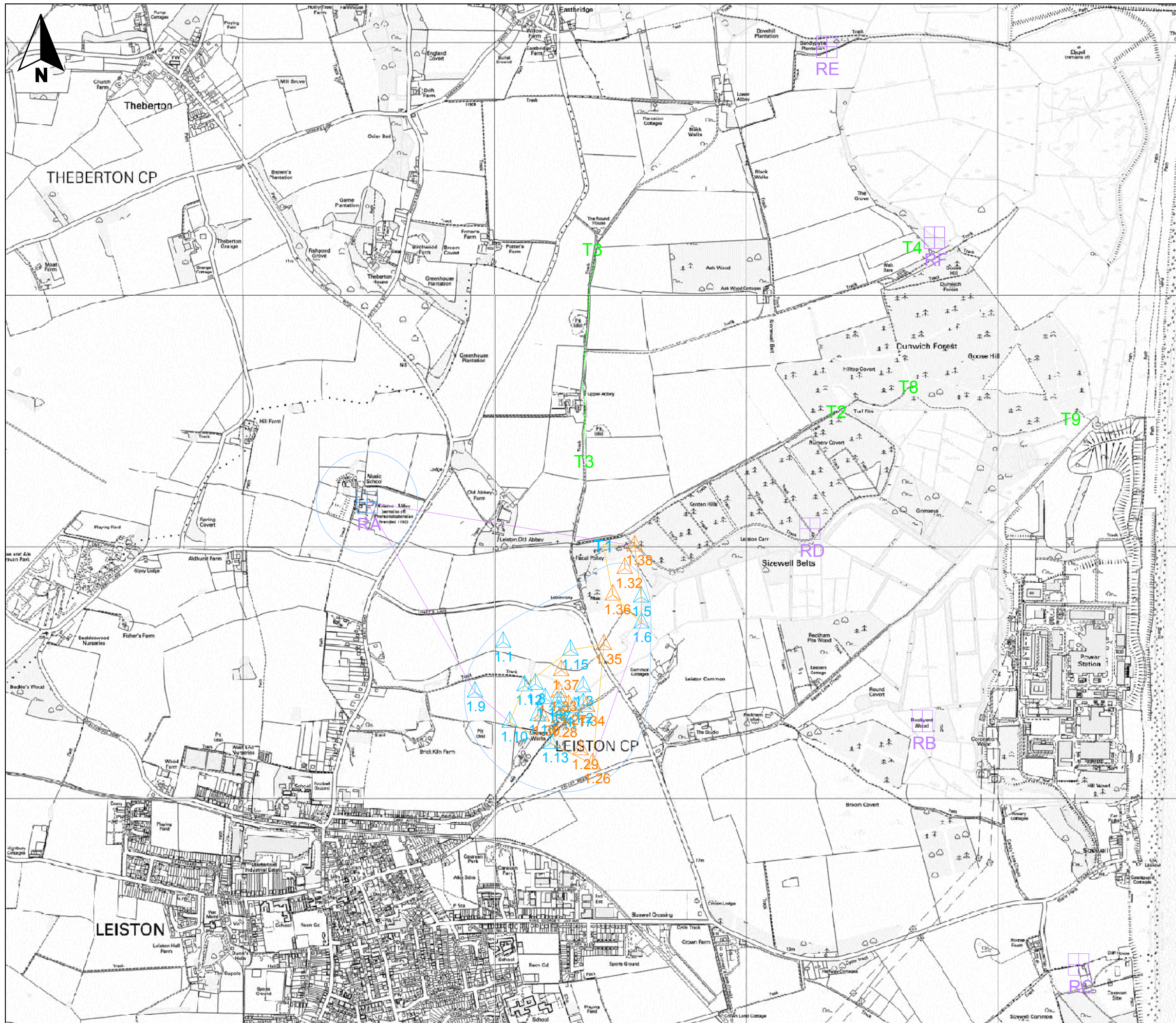
Sizewell Bat Report 2011









Figure C19
Bat 20 - breeding female
barbastelle - triangulation points

January 2012
 28130_A260.dwg tugwc



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- KEY**
-  Roost B
 -  Roost A used by bat 1
 -  Mist net/harp trap trapping location 1 - bat 1 caught here
 -  Bat 1 joint bearing triangulation point 6
 -  Bat 1 additional point 36
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



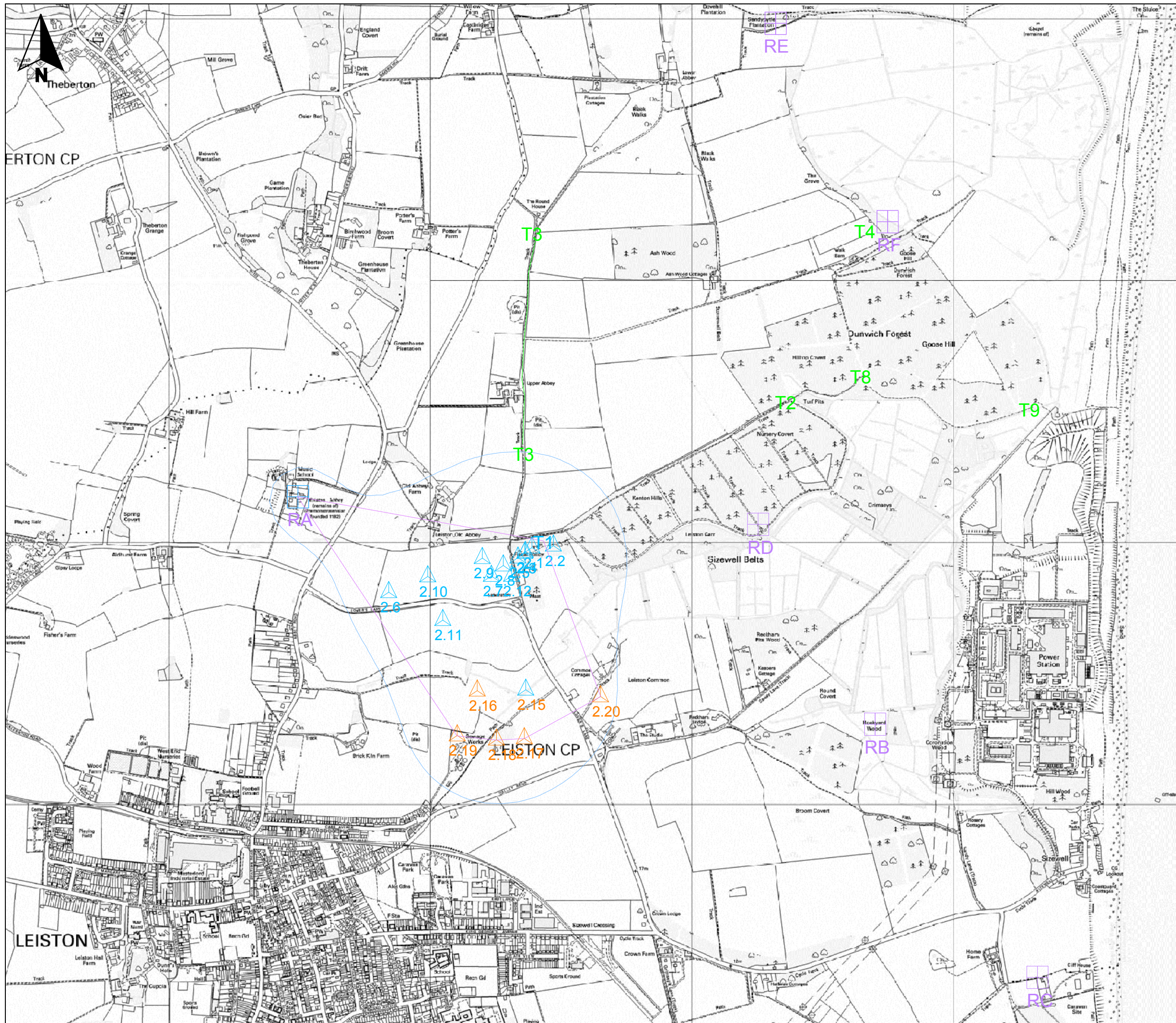
Sizewell Bat Report 2011









Figure C20
Bat 1 - breeding female Natterer's bat - triangulation points

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- KEY**
-  Roost B
 -  Roost A used by bat 2
 -  Mist net/harp trap trapping location 1 - bat 2 caught here
 -  Bat 2 joint bearing triangulation point 6
 -  Bat 1 additional point 36
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



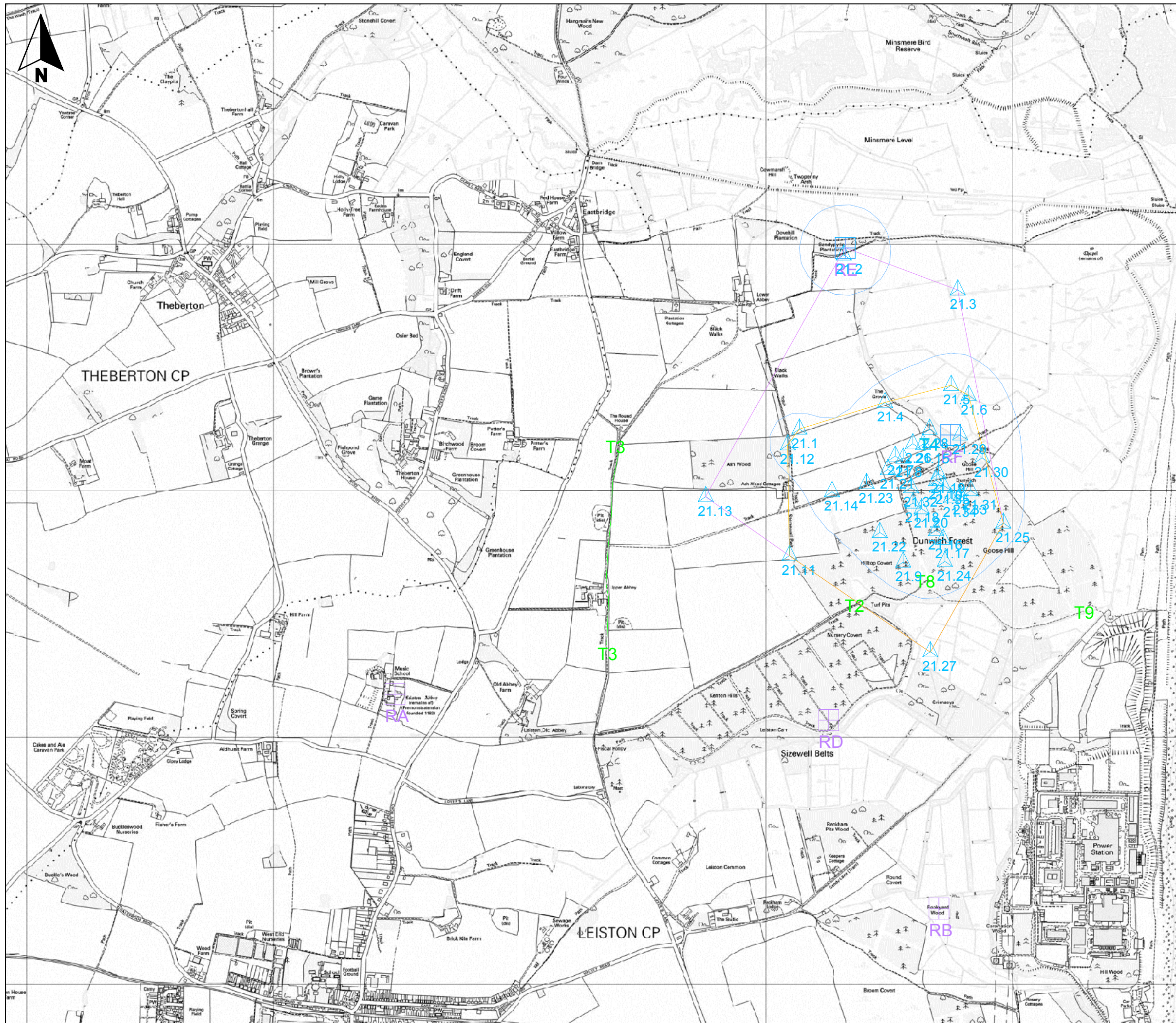
Sizewell Bat Report 2011

Figure C21
Bat 2 - breeding female Natterer's bat - triangulation points

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- KEY**
- RA Roost A
 - RE Roost E used by bat 21
 - T4 Mist net/harp trap trapping location 4 - bat 21 caught here
 - 21.24 Bat 21 joint bearing triangulation point 24
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



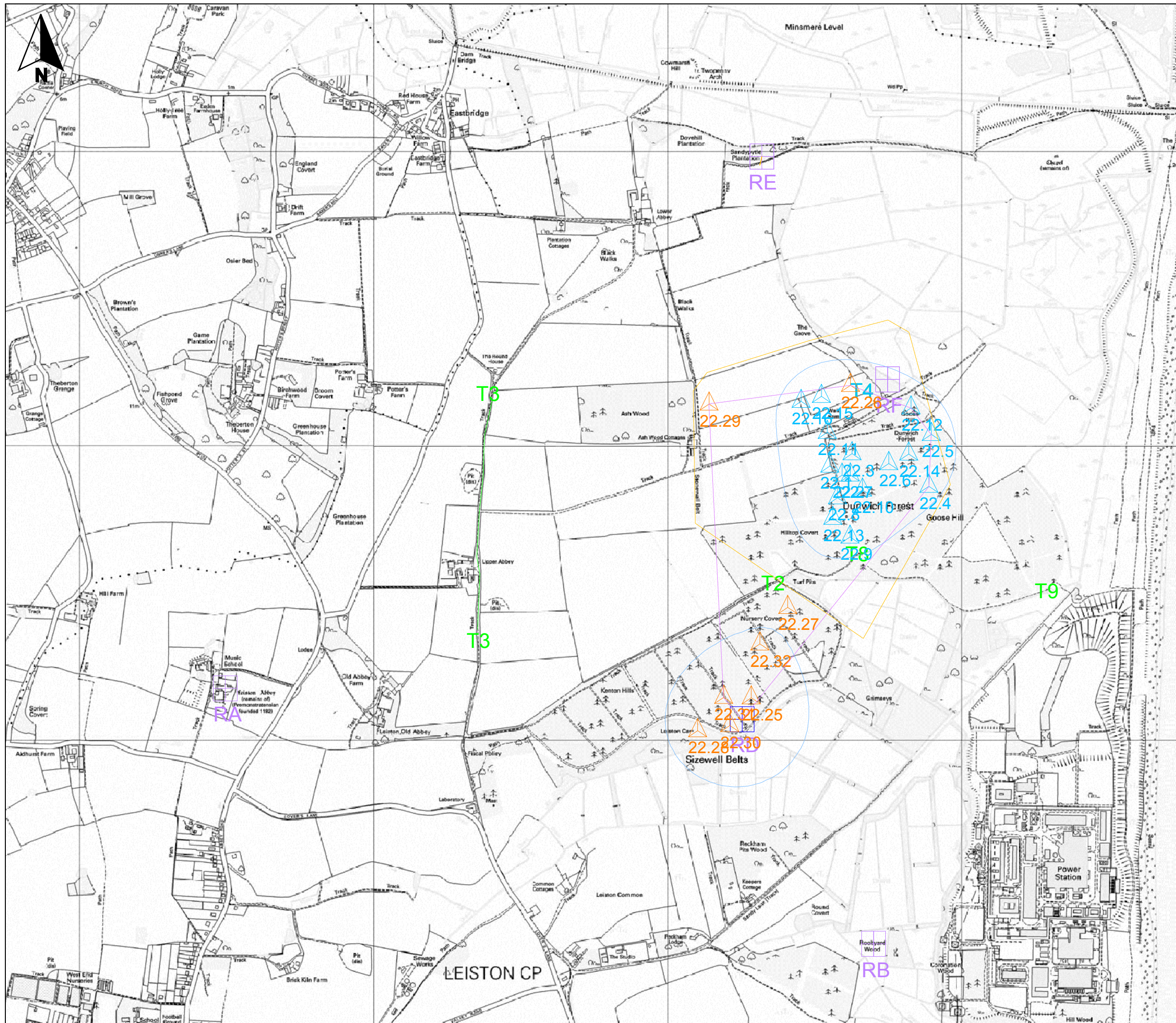
Sizewell Bat Report 2011

Figure C22
Bat 21 - breeding female Natterer's bat - triangulation points

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- KEY
- Roost A
 - Roost D used by bat 22
 - Mist net/harp trap trapping location 4 - bat 22 caught here
 - Bat 22 joint bearing triangulation point 4
 - Bat 22 joint bearing triangulation point 27
 - 95% kernel analysis
 - 95% cluster analysis
 - 95% MCP analysis



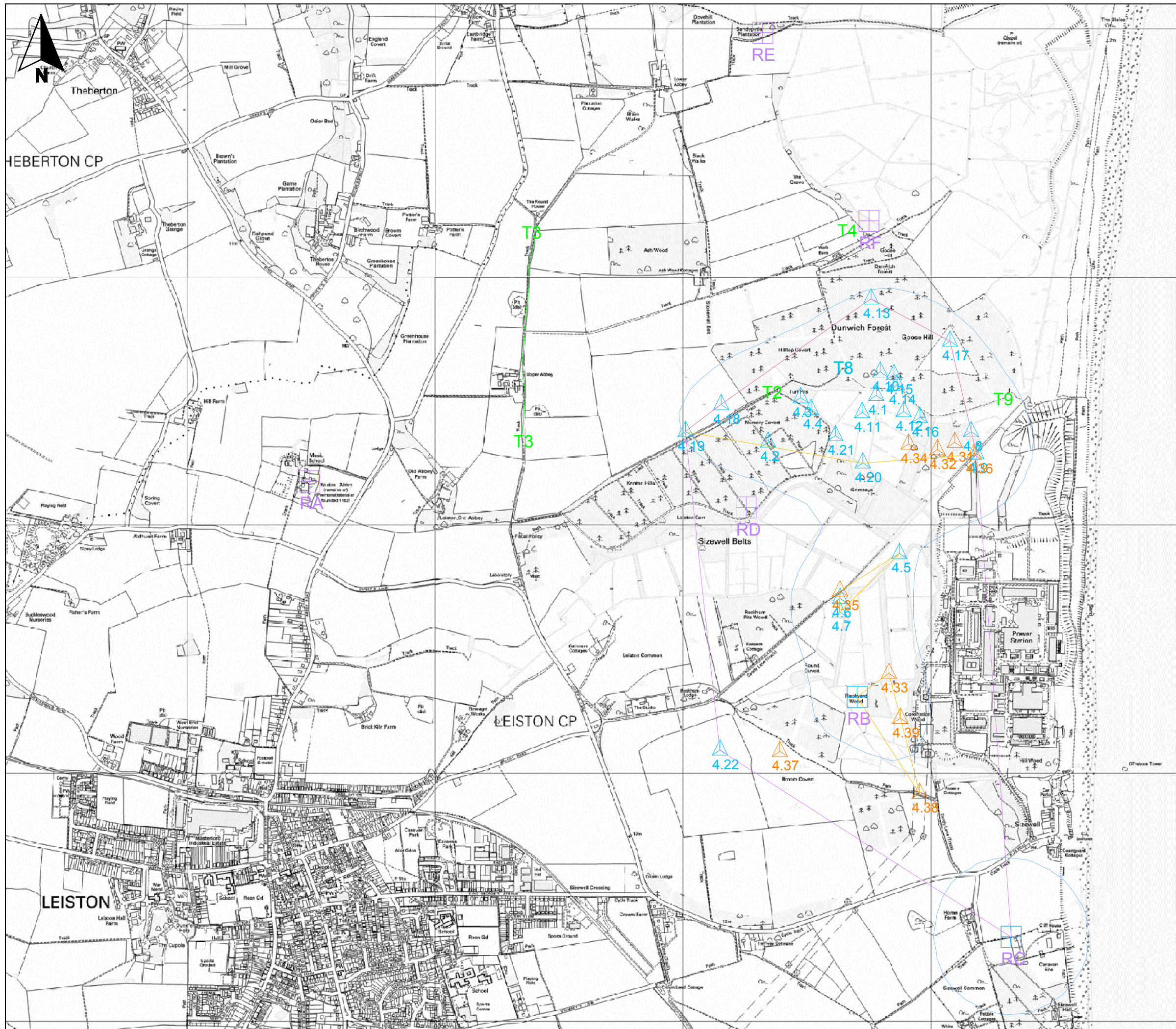
Sizewell Bat Report 2011









Figure C23
Bat 22 - non-breeding female
Natterer's bat - triangulation points

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- KEY
-  Roost A
 -  Roost C used by bat 4
 -  Mist net/harp trap trapping location 8 - bat 4 caught here
 -  Bat 4 joint bearing triangulation point 6
 -  Bat 4 additional point 34
 -  95% kernel analysis
 -  95% cluster analysis
 -  95% MCP analysis



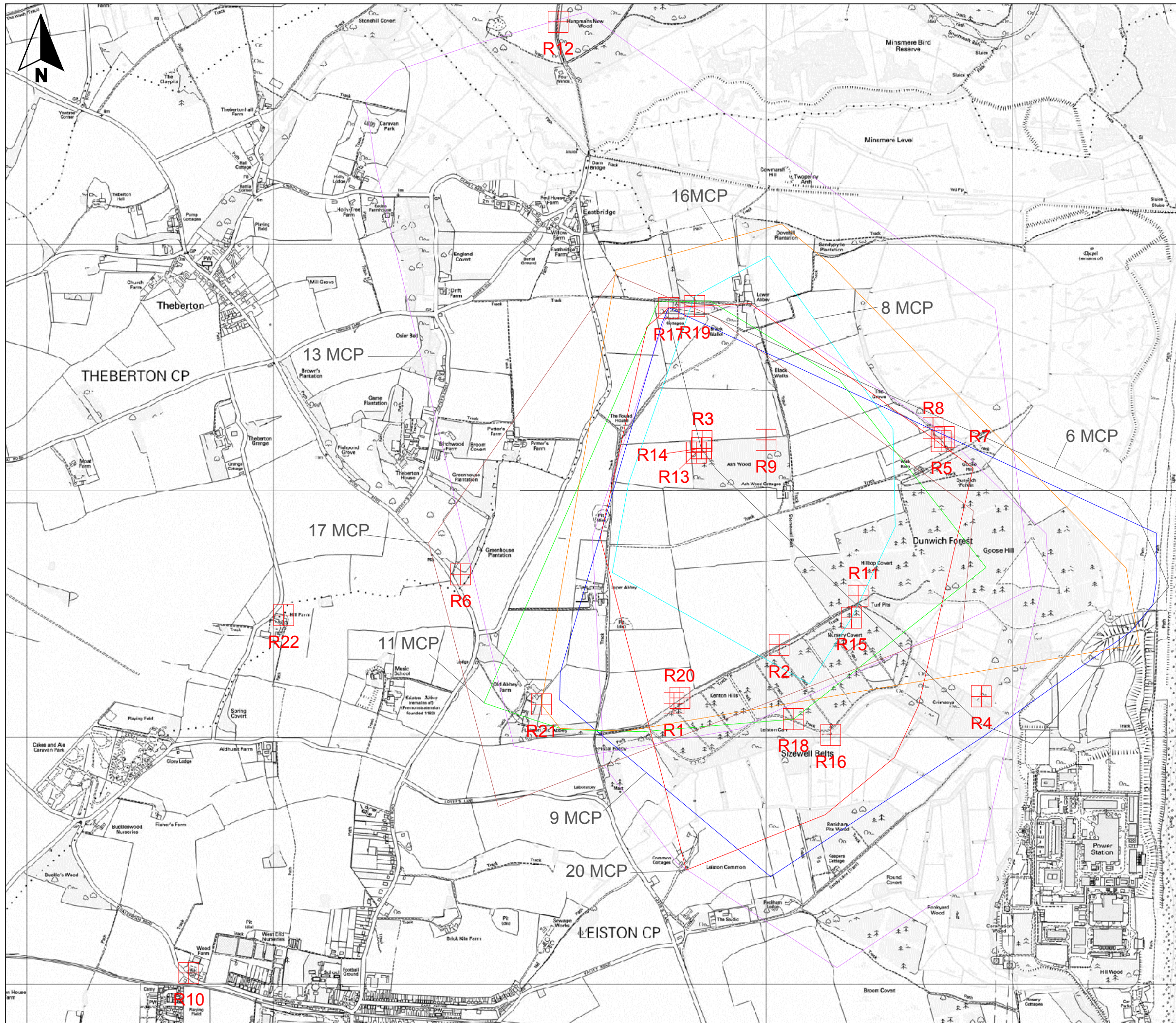
Sizewell Bat Report 2011

Figure C24
Bat 4 - breeding female brown long-eared bat - triangulation points

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KEY

- Bat 6
- Bat 8
- Bat 9
- Bat 11
- Bat 13
- Bat 16
- Bat 17
- Bat 20

NB bat 16 non-breeding



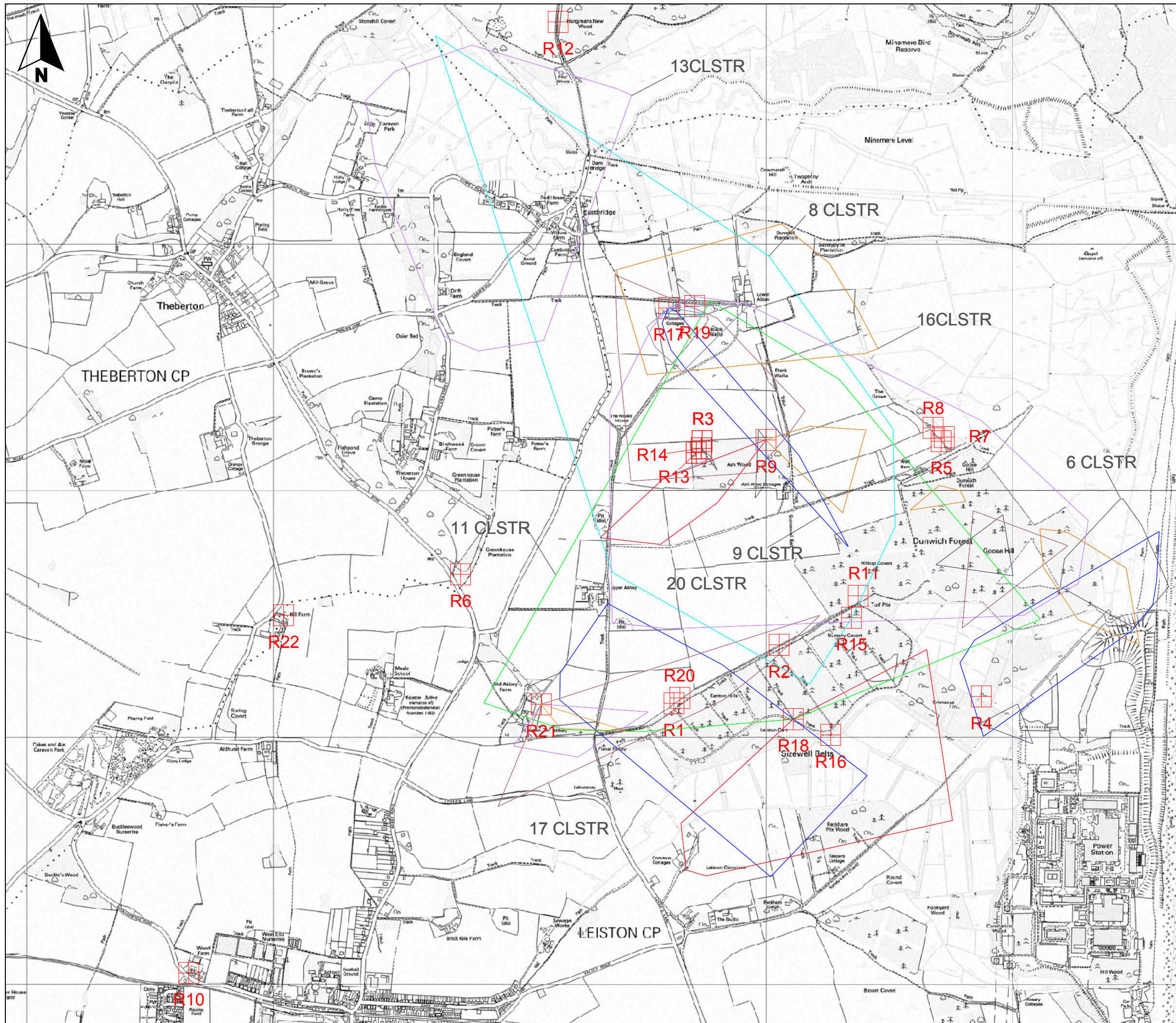
Sizewell Bat Report 2011

Figure C25
Adult female barbastelles - MCP
95% analysis

January 2012
 28130_A266.dwg tugwc



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KEY

- Bat 6
- Bat 8
- Bat 9
- Bat 11
- Bat 13
- Bat 16
- Bat 17
- Bat 20

NB bat 16 non-breeding



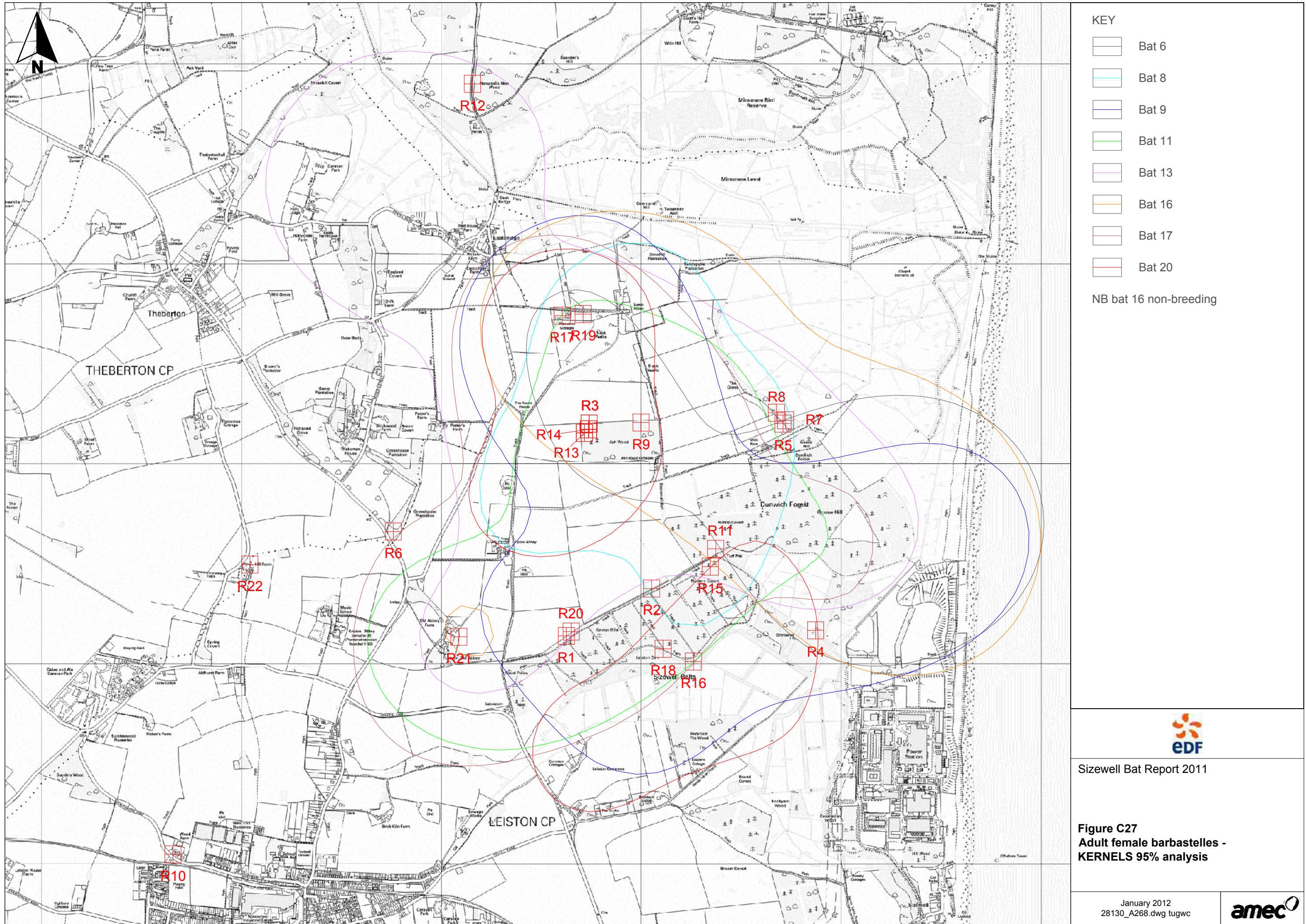
Sizewell Bat Report 2011

Figure C26
Adult female barbastelles -
CLUSTERS 95% analysis

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KEY

- Bat 6
- Bat 8
- Bat 9
- Bat 11
- Bat 13
- Bat 16
- Bat 17
- Bat 20

NB bat 16 non-breeding



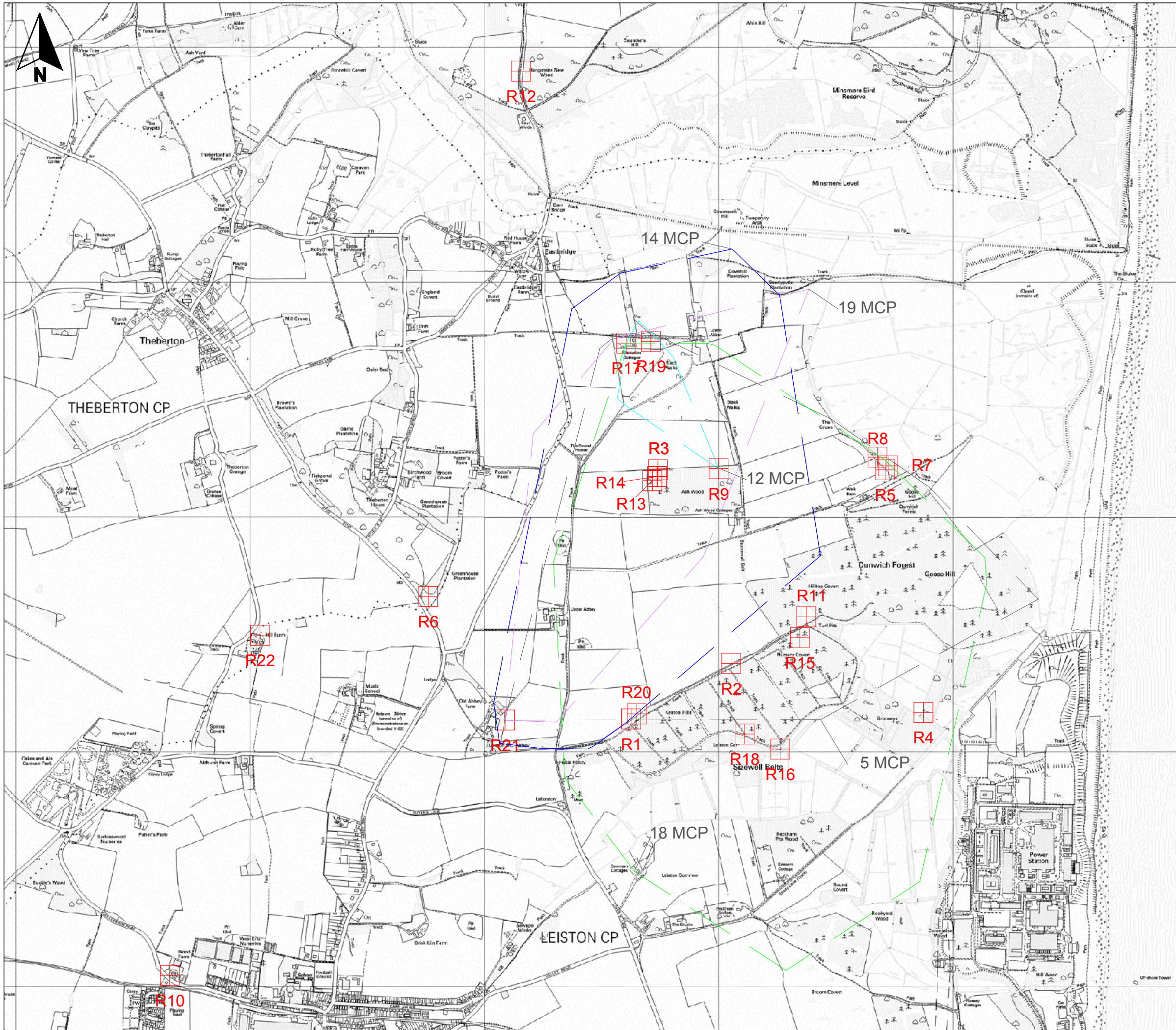
Sizewell Bat Report 2011

Figure C27
Adult female barbastelles -
KERNELS 95% analysis

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KEY

	Bat 5
	Bat 12
	Bat 14
	Bat 18
	Bat 19



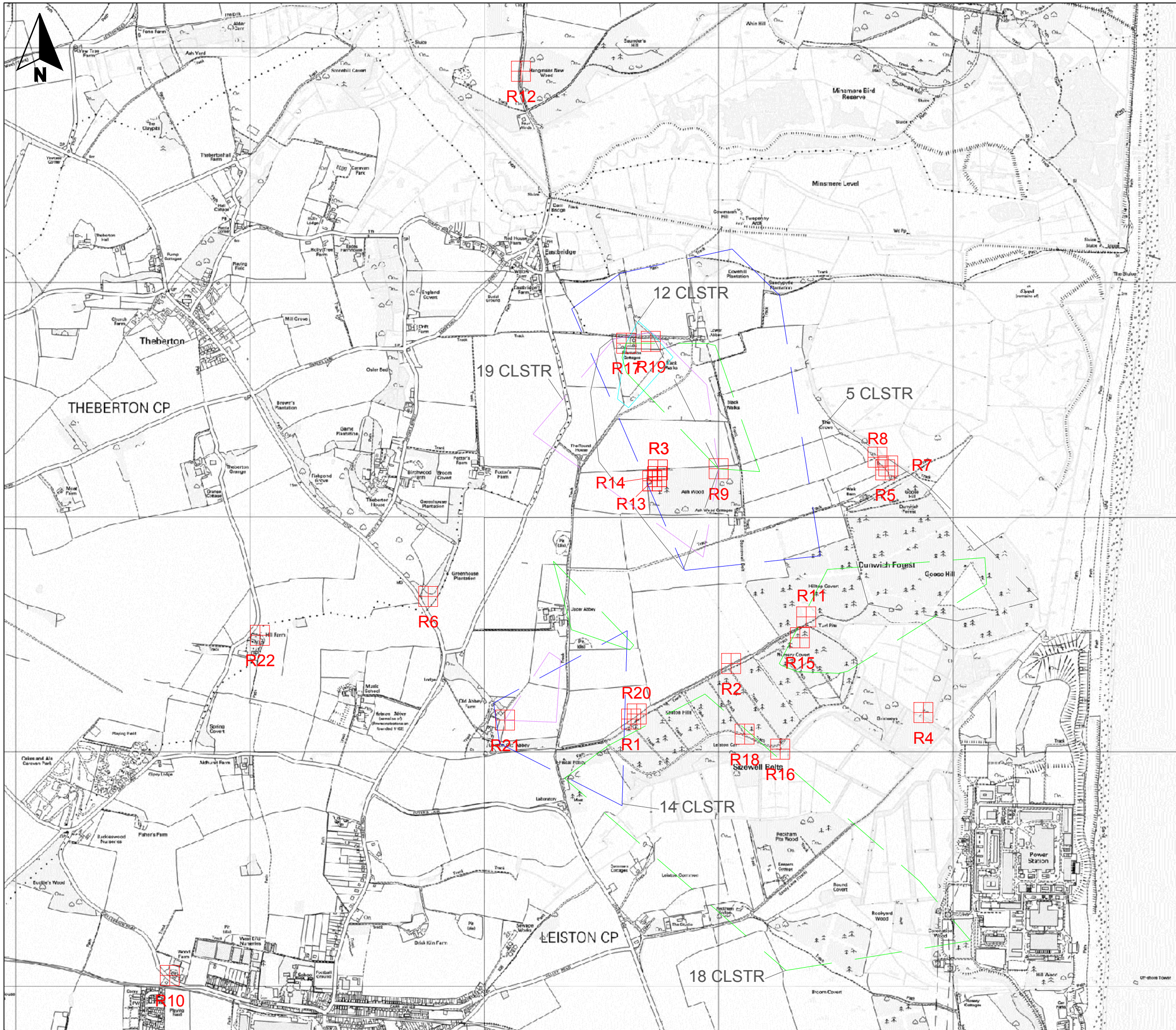
Sizevell Bat Report 2011

Figure C28
Juvenile barbastelles -
MCP 95% analysis

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KEY

	Bat 5
	Bat 12
	Bat 14
	Bat 18
	Bat 19



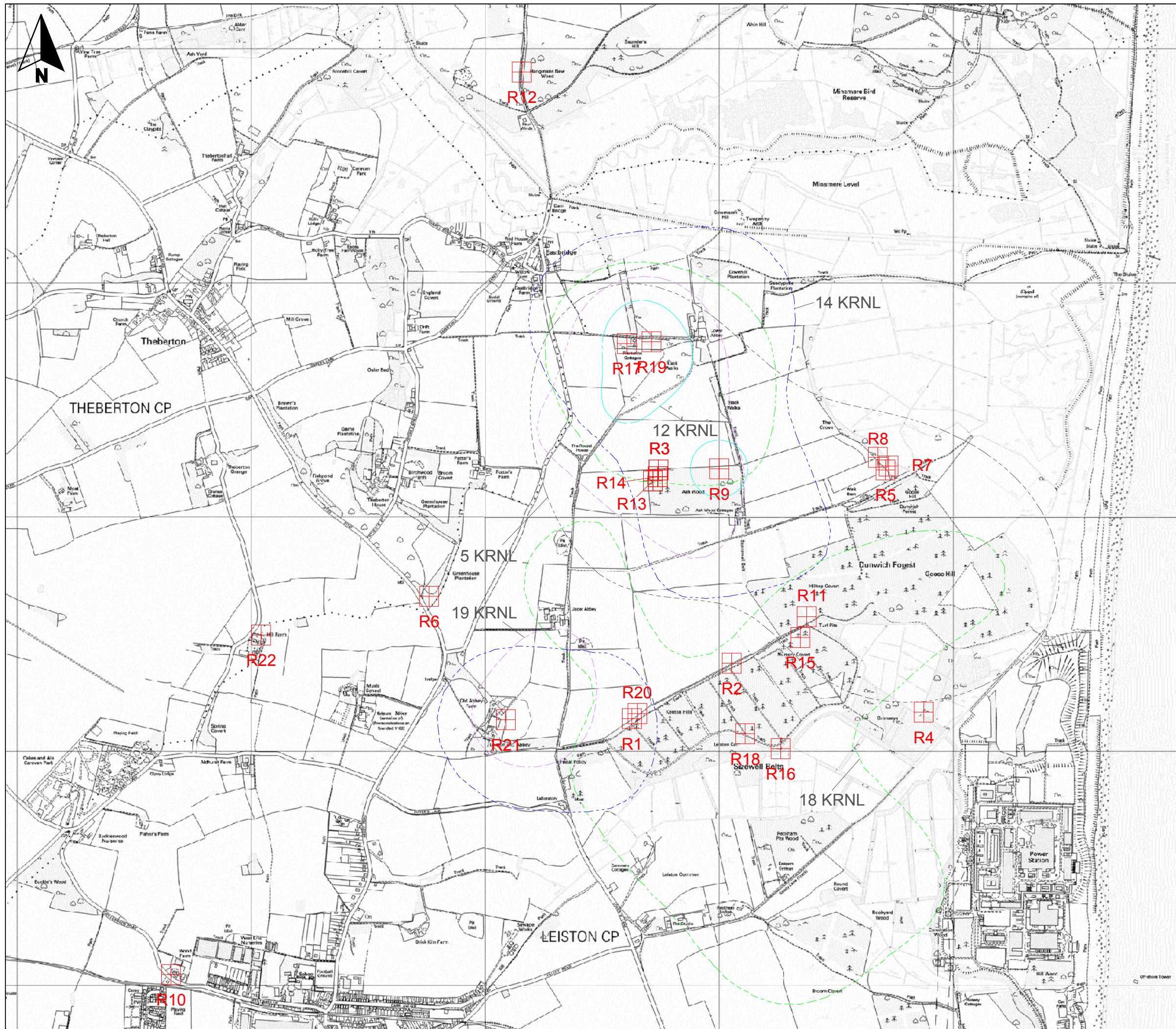
Sizewell Bat Report 2011

Figure C29
 Juvenile barbastelles -
 CLUSTER 95% analysis

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KEY	
	Bat 5
	Bat 12
	Bat 14
	Bat 18
	Bat 19



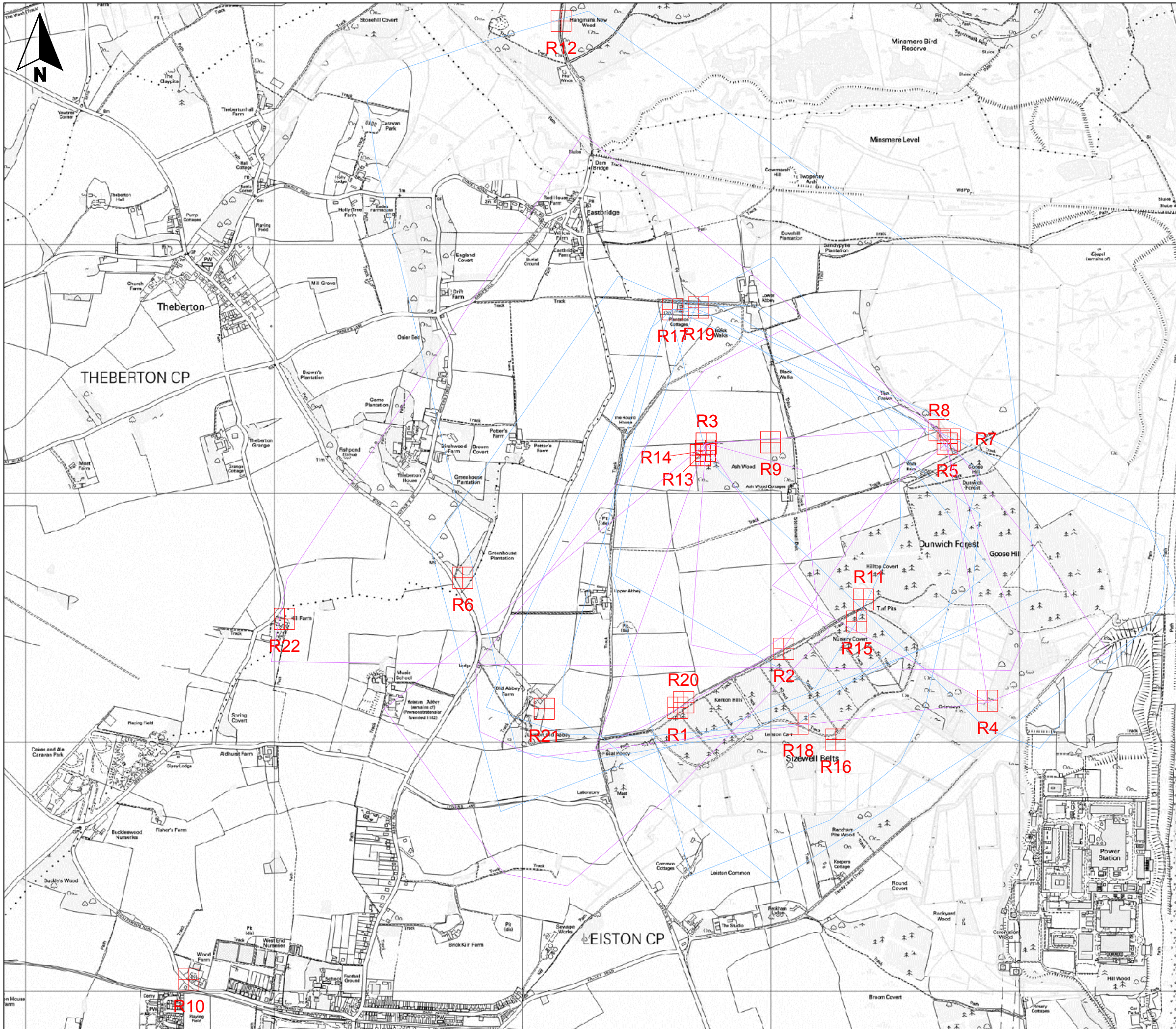
Sizewell Bat Report 2011

Figure C30
 Juvenile barbastelles -
 KERNEL 95% analysis

January 2012
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KEY

2011

2010



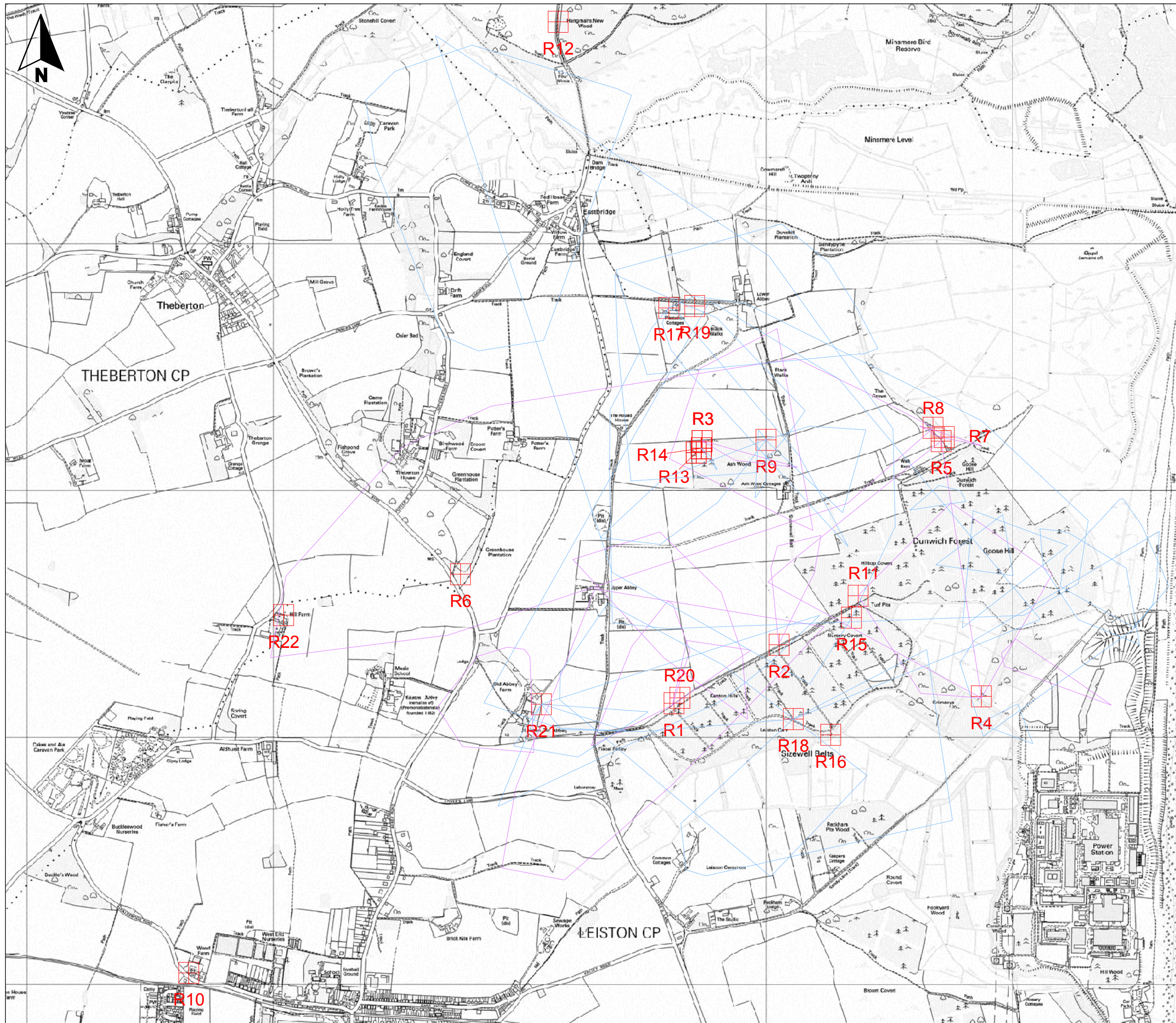
Sizewell Bat Report 2011

Figure C31
Adult female barbastelles - MCP
95% analysis - 2010 vs 2011

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KEY

2011

2010



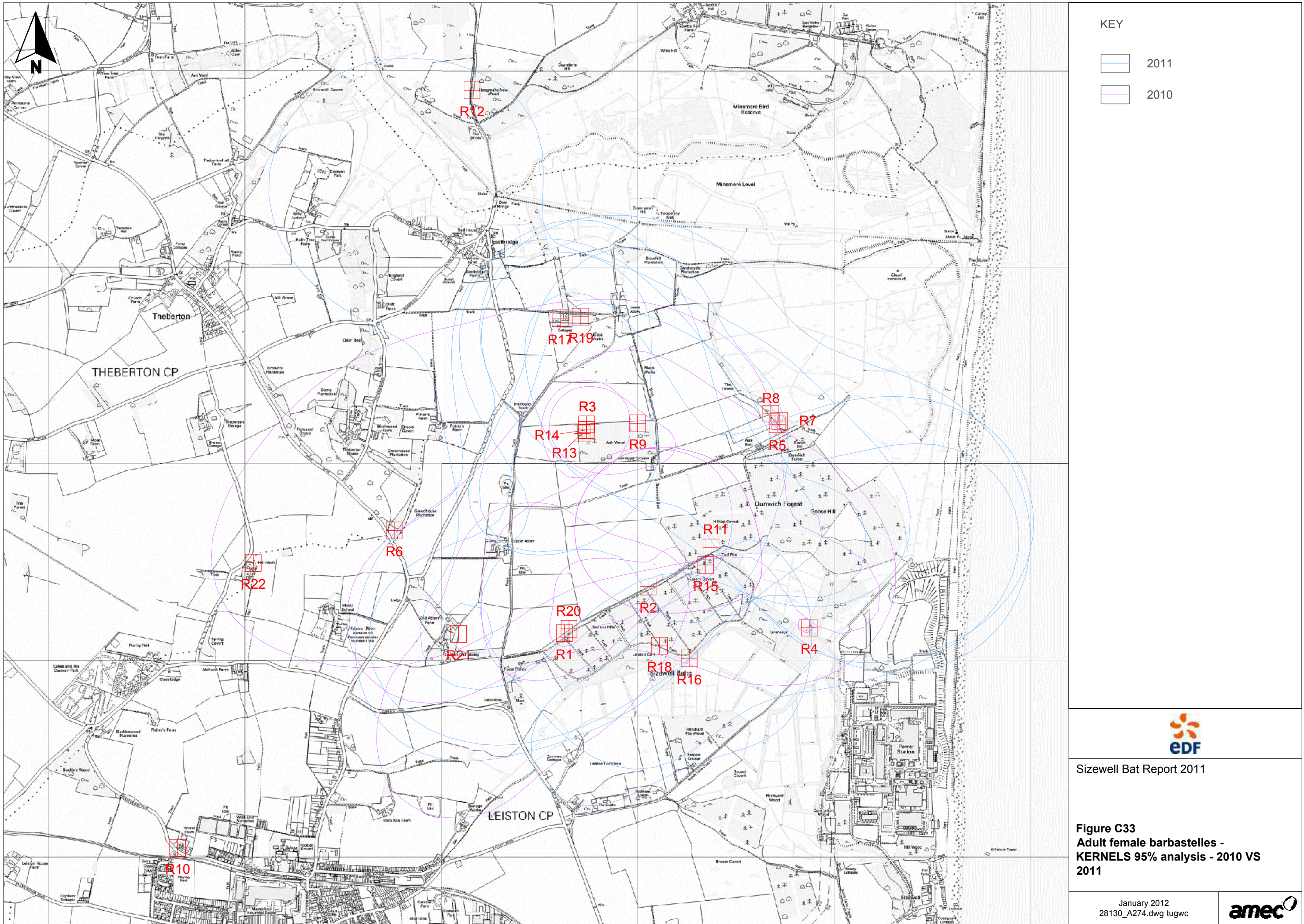
Sizewell Bat Report 2011

Figure C32
Adult female barbastelles -
CLUSTERS 95% analysis - 2010 VS
2011

January 2012
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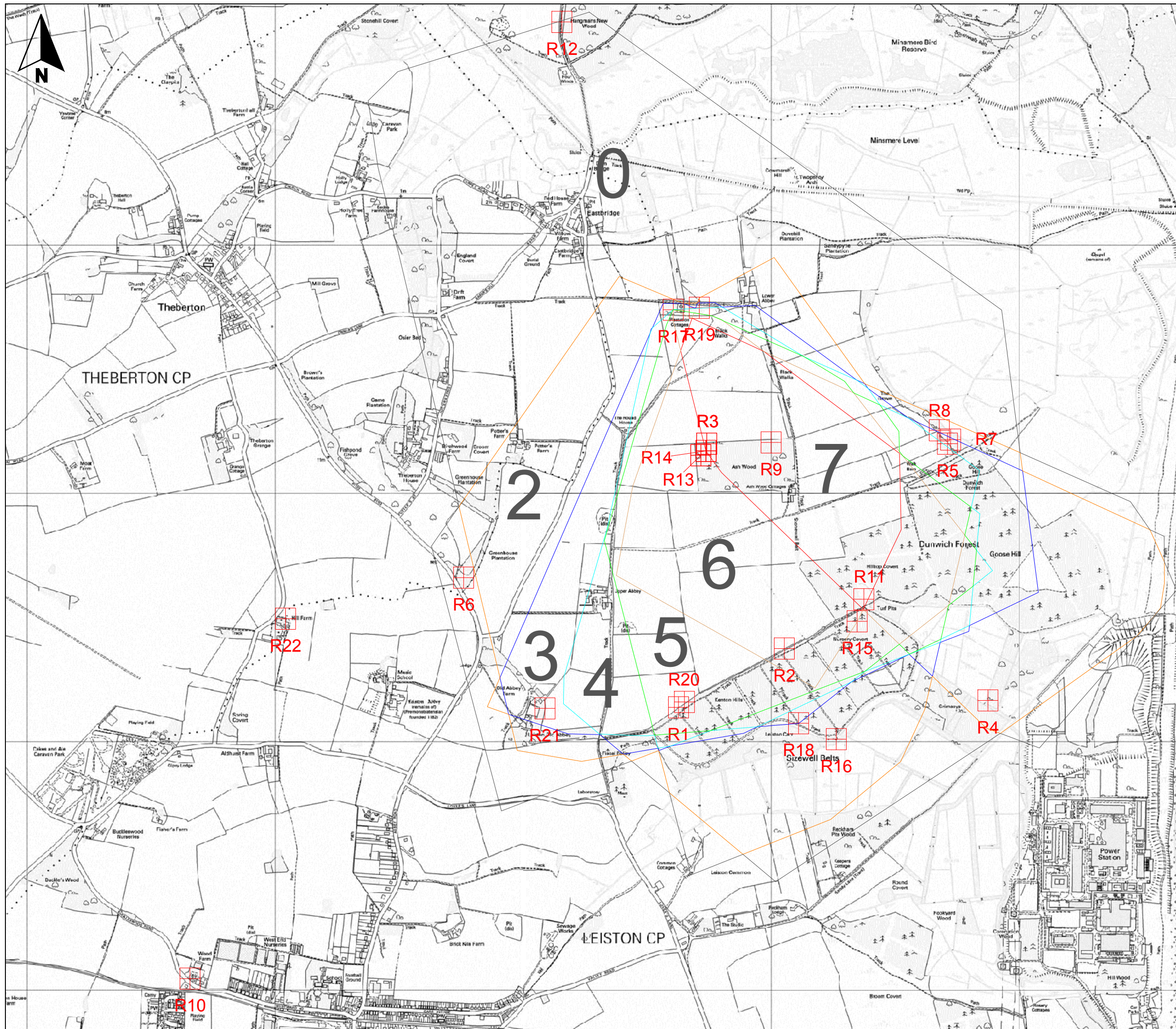
Sizewell Bat Report 2011

Figure C33
Adult female barbastelles -
KERNELS 95% analysis - 2010 VS
2011

January 2012
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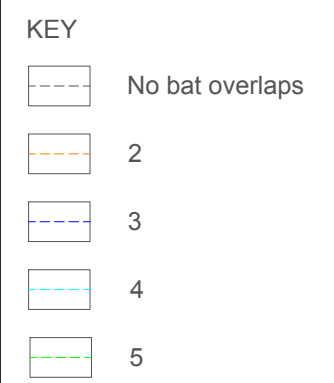
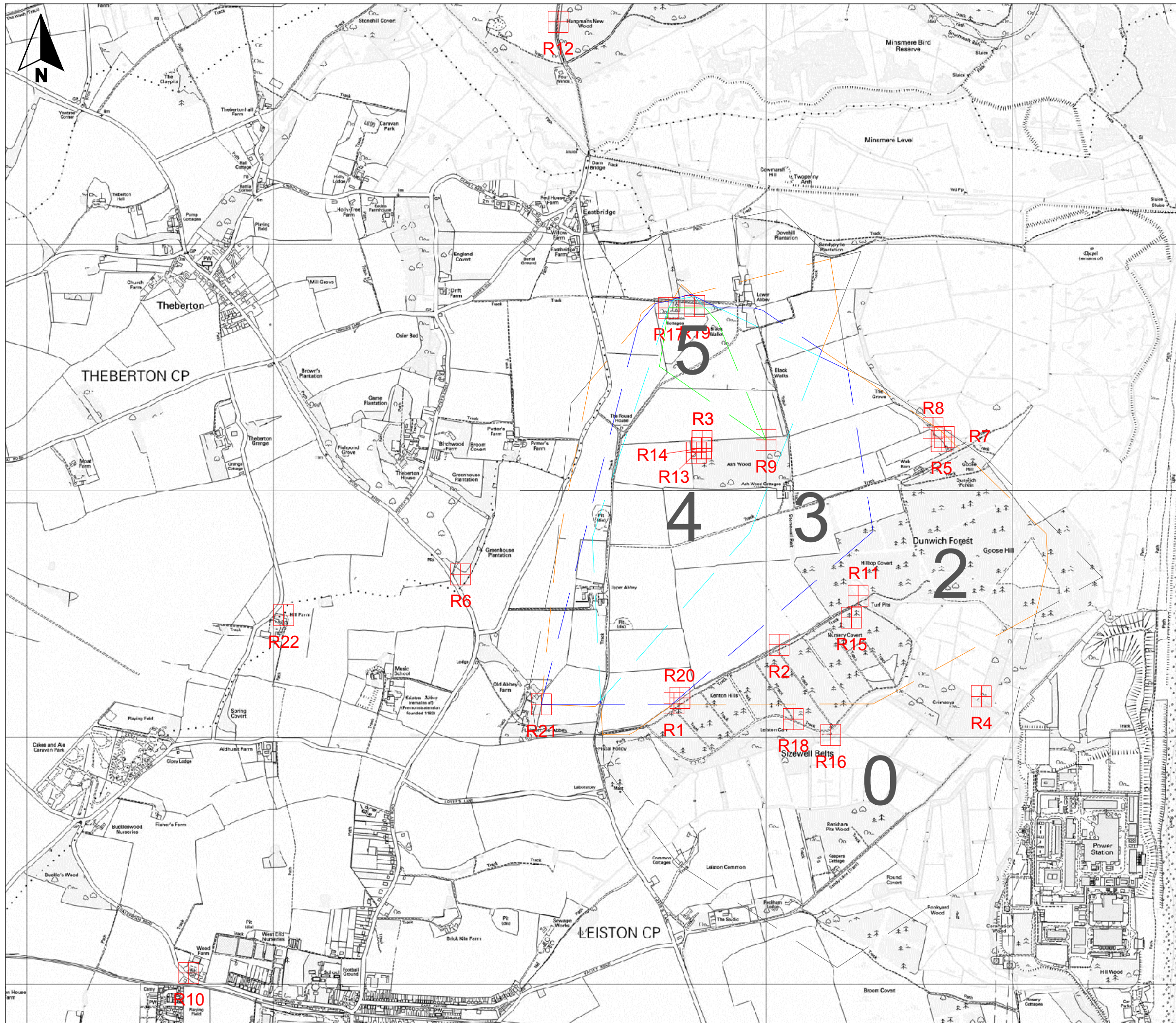
Sizewell Bat Report 2011

Figure C34
Breeding female barbastelles -
MCP 95% number of bat overlaps

January 2012
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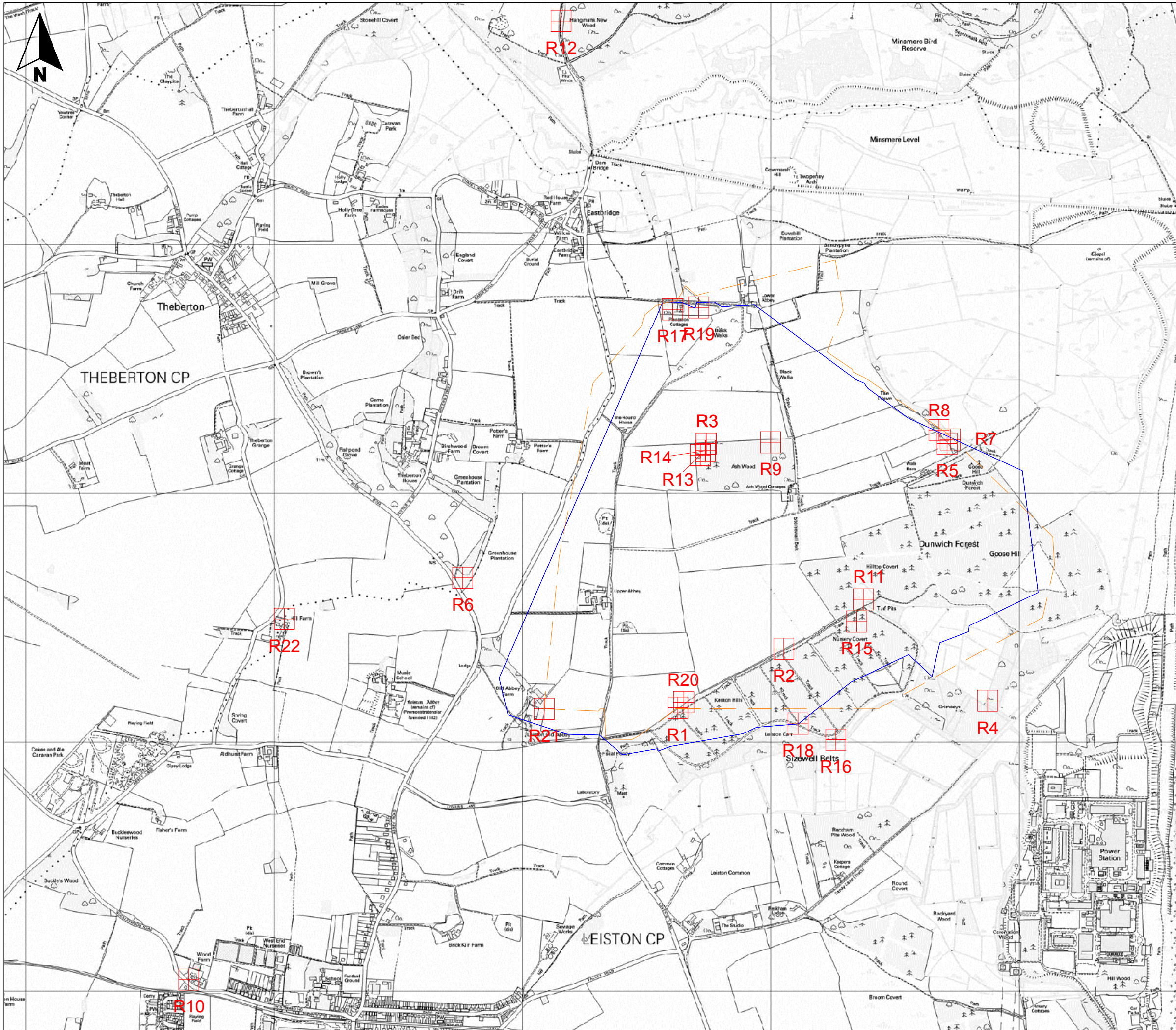
Sizewell Bat Report 2011

Figure C35
 Juvenile barbastelles - MCP 95%
 number of bat overlaps



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KEY

-  2 juvenile MCP overlaps
-  3 breeding female MCP overlaps

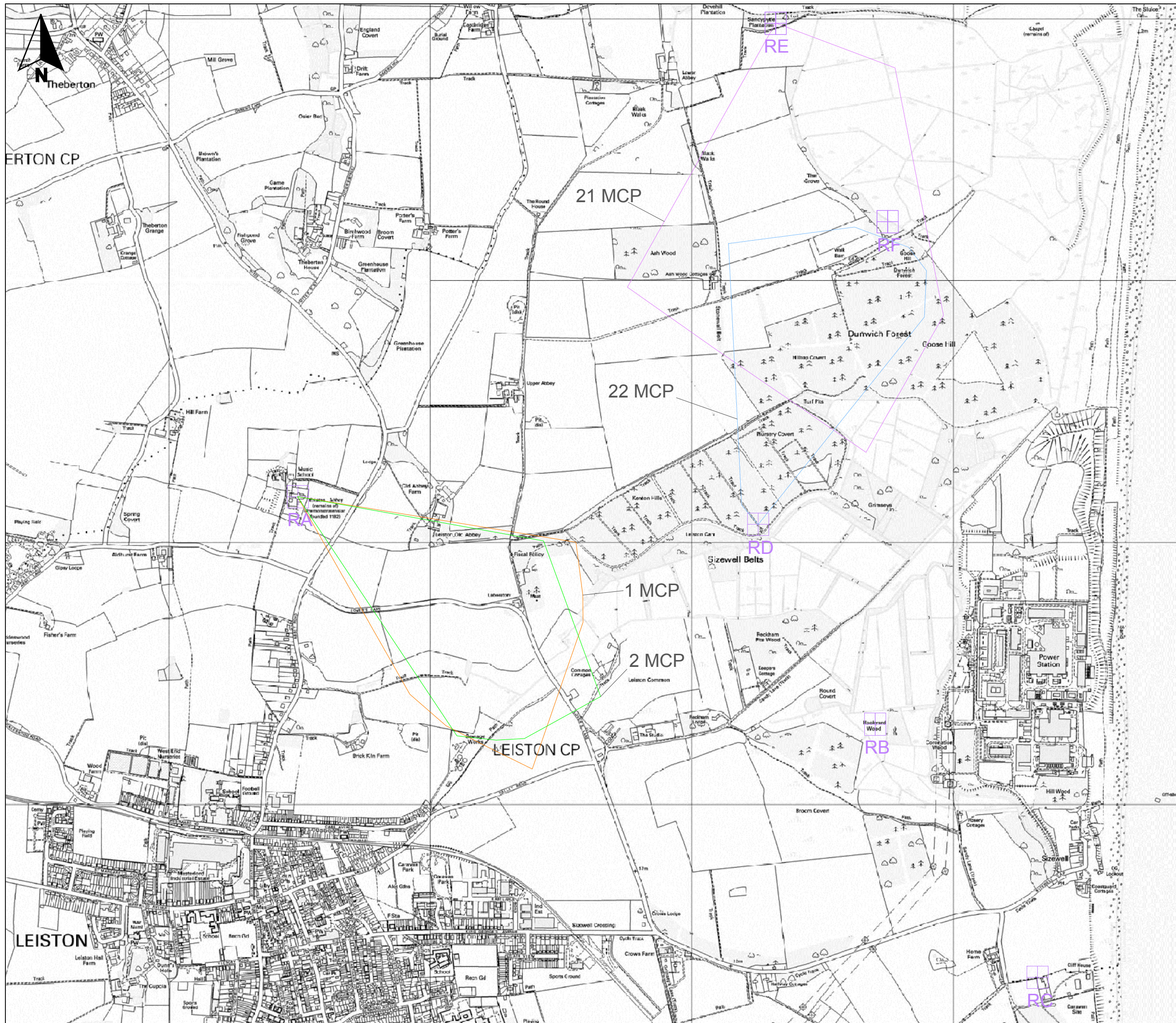


Sizewell Bat Report 2011

Figure C36
Comparison of 3 breeding female vs
2 juvenile MCP overlaps

January 2012
 28130_A277.dwg twgwc





- KEY
- Bat 1
 - Bat 2
 - Bat 21
 - Bat 22



Sizewell Bat Report 2011

Figure C37
Adult female Natterer's bat - MCP
95% comparison

January 2012
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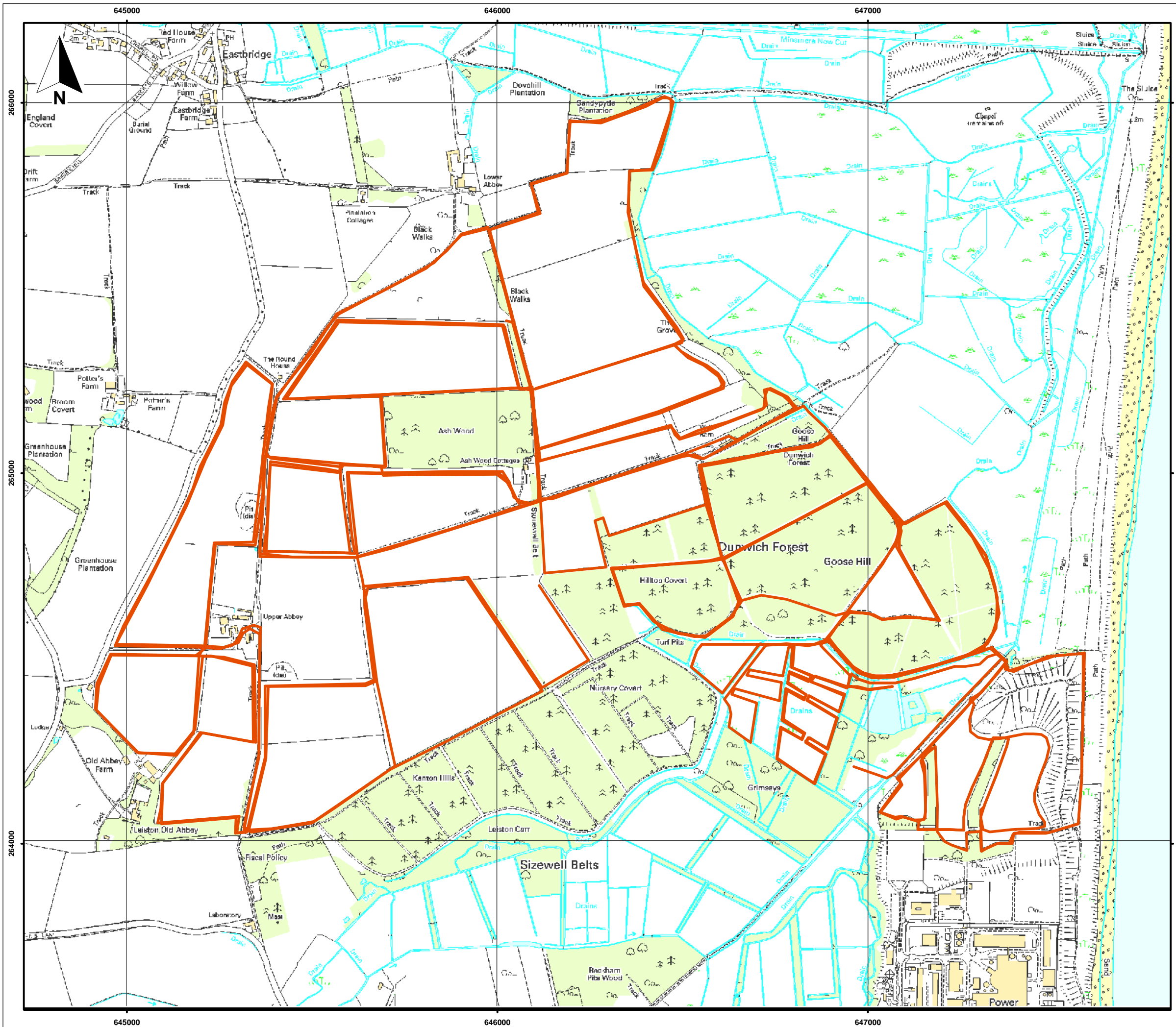
Appendix D

Walked Transect Results

Table D1 Number of Passes, Relative Activity (B/H) and Species Recorded during Walked Transects

Date	12/04	26/04	10/05	23/05	07/06	21/06	05/07	18/07	01/08	22/08	06/09	29/09	Total	B/h	% of total
<i>Myotis</i> species	1	2		4	1	6		2	5	1	1	1	24	0.8	1.6
Noctule		1	1		4	4	1		1	1	4	2	19	0.6	1.3
<i>Nyctalus</i> species					4			3					7	0.2	0.5
Leisler's bat						1			1		1		3	0.1	0.2
Leisler's bat / serotine						22		6	2		3		33	1.1	2.2
Serotine						24		1			3		28	0.9	1.9
Common pipistrelle	138	39	15	33	16	20	19	63	19	10	8	8	388	12.6	26.0
Common/soprano pipistrelle	52	10	1	3	30	17	3			3	5		124	4.0	8.3
Soprano pipistrelle	186	102	19	52	70	82	35	65	9	60	70	16	766	24.9	51.3
Common/ Nathusius' pipistrelle	1	1											2	0.1	0.1
Nathusius' pipistrelle	23												23	0.7	1.5
Brown long-eared bat				1		1				1	1		4	0.1	0.3
Barbastelle				10		3		3	32	1	24		71	2.3	4.8
Grand Total	401	155	36	103	125	180	58	143	69	77	120	27	1492		
Survey duration (min)	180	145	147	173	168	144	121	161	166	152	133	155	1845		
Total B/h	133.7	64.1	14.7	35.7	44.6	75.0	28.8	53.3	24.9	30.4	54.1	10.5	48.5		





Key:
 Transect routes

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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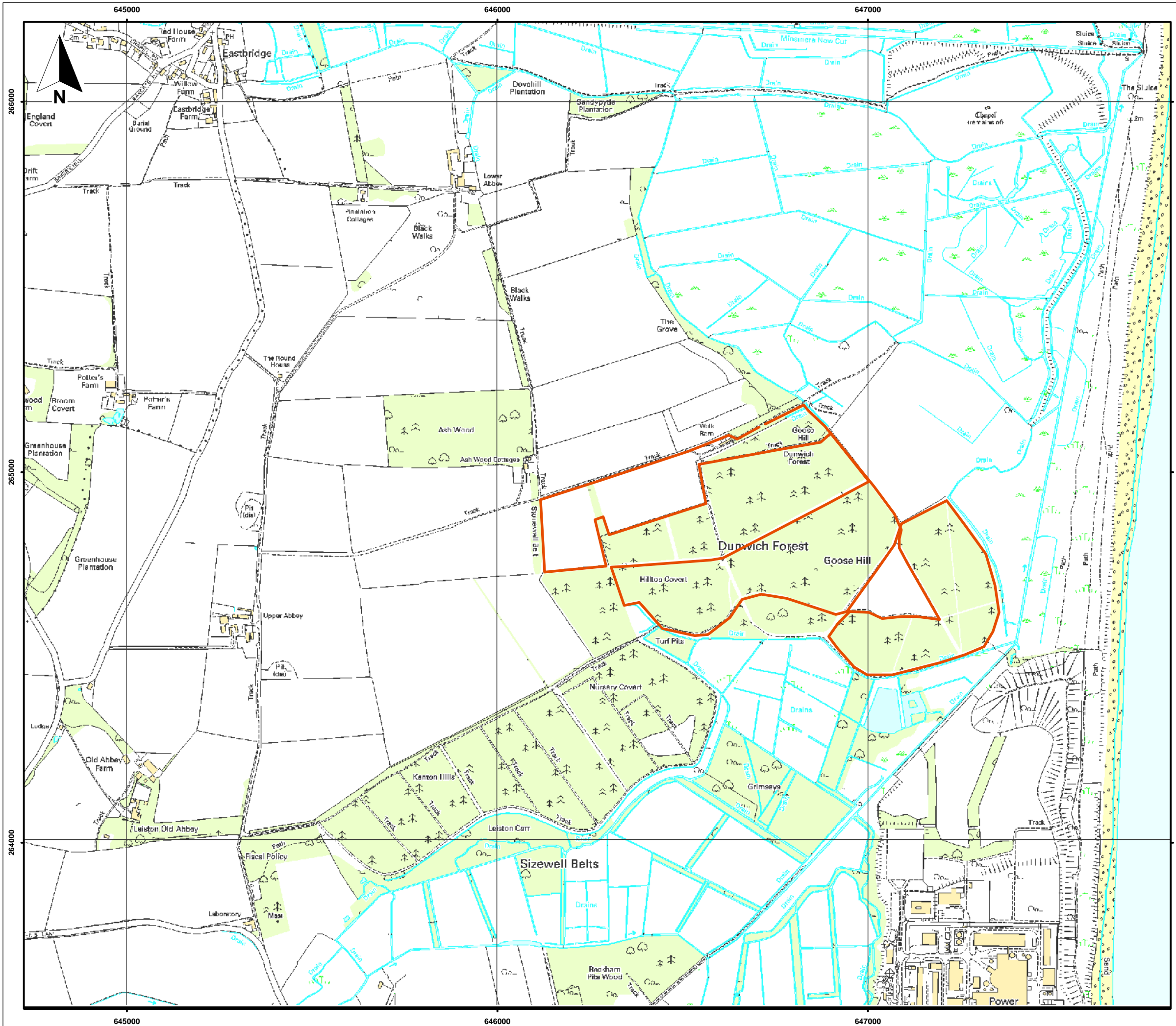
Sizewell Bat Report 2011

Figure D1
Combined 2011 walked
transect bat survey routes

January 2011
 28130-A279.mxd tugwc



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Key:
— Transect 1
 12th April

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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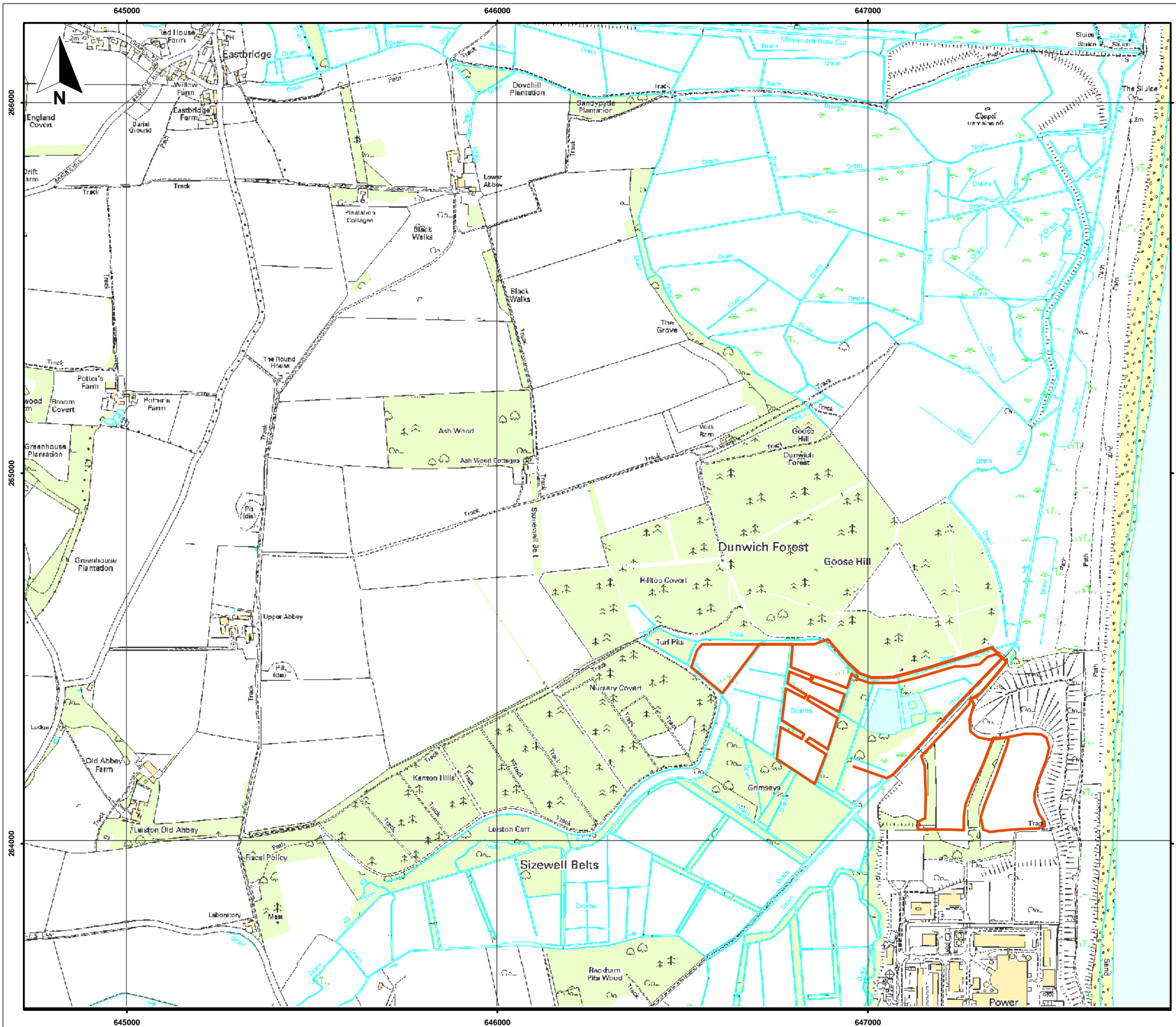
Sizewell Bat Report 2011

Figure D2
 Walked transect route 1 April

January 2011
 28130-A280.mxd tugwc



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Key:
— Transect 2
 26th April

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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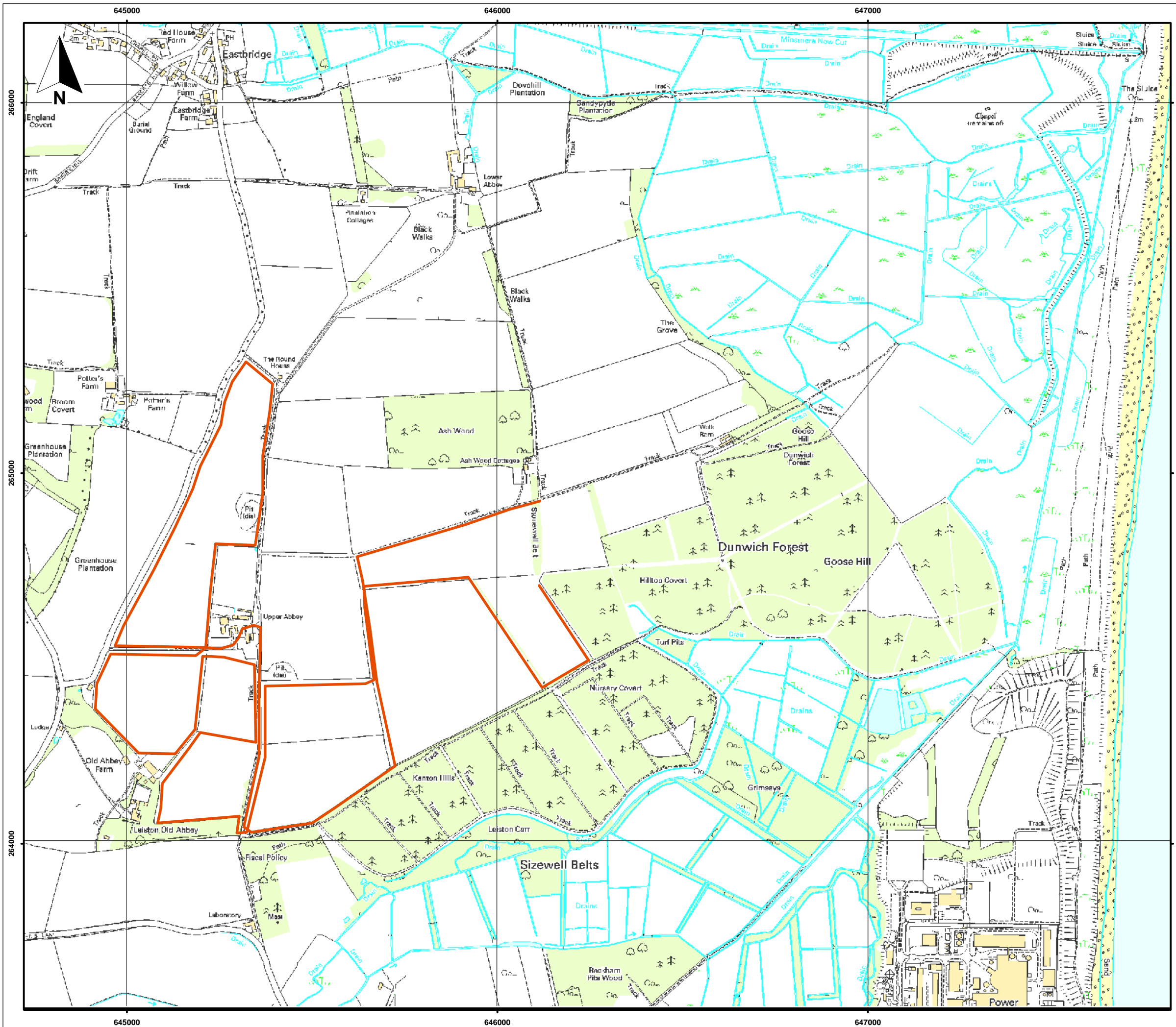
Sizewell Bat Report 2011

Figure D3
 Walked transect route 2 April

January 2011
 28130-A281.mxd tugwc



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Key:
— Transect 3
 10th May

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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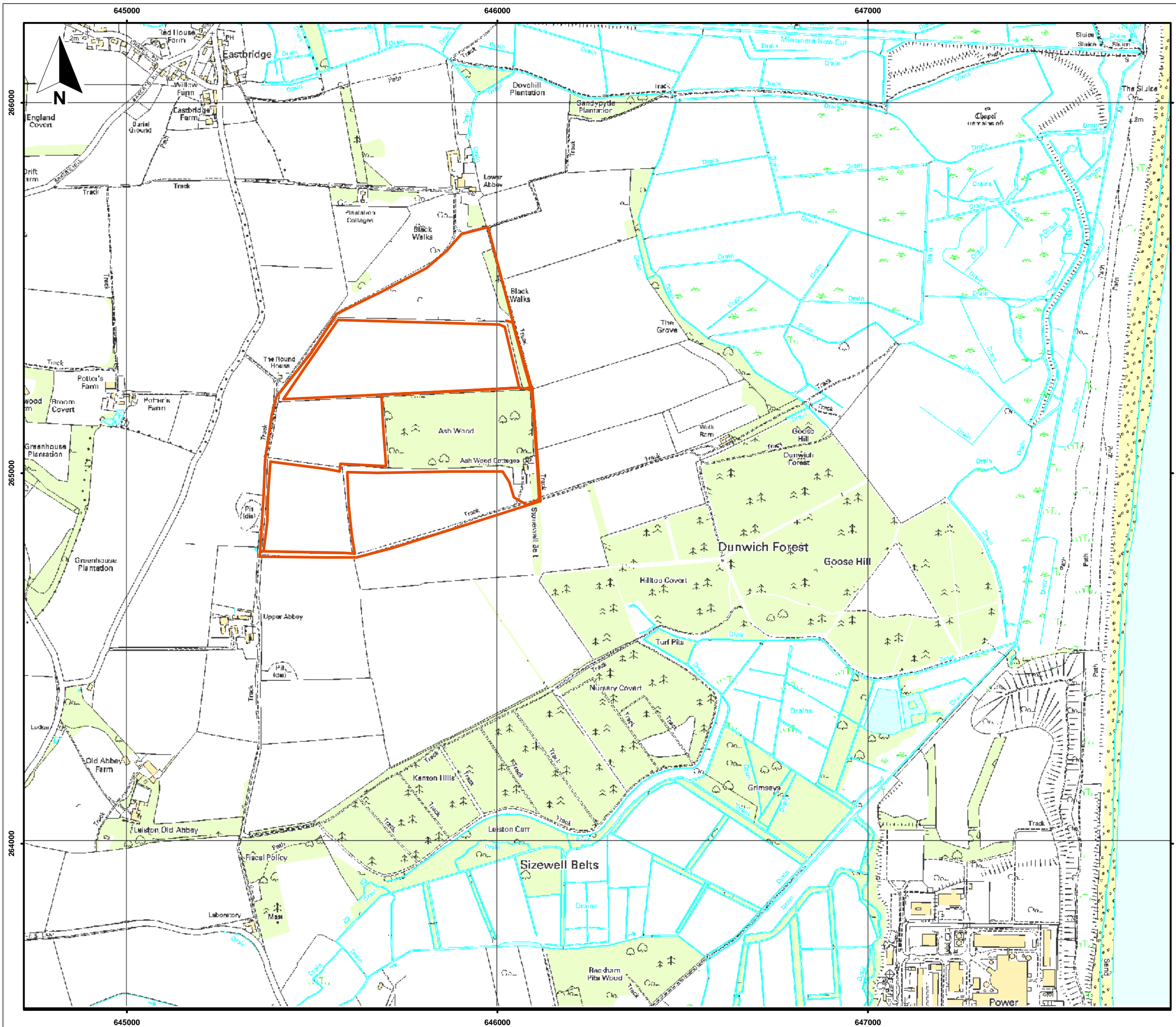
Sizewell Bat Report 2011


Figure D4
 Walked transect route 3 May

January 2011
 28130-A282.mxd tugwc



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Key:
 Transect
 4 - 23rd May

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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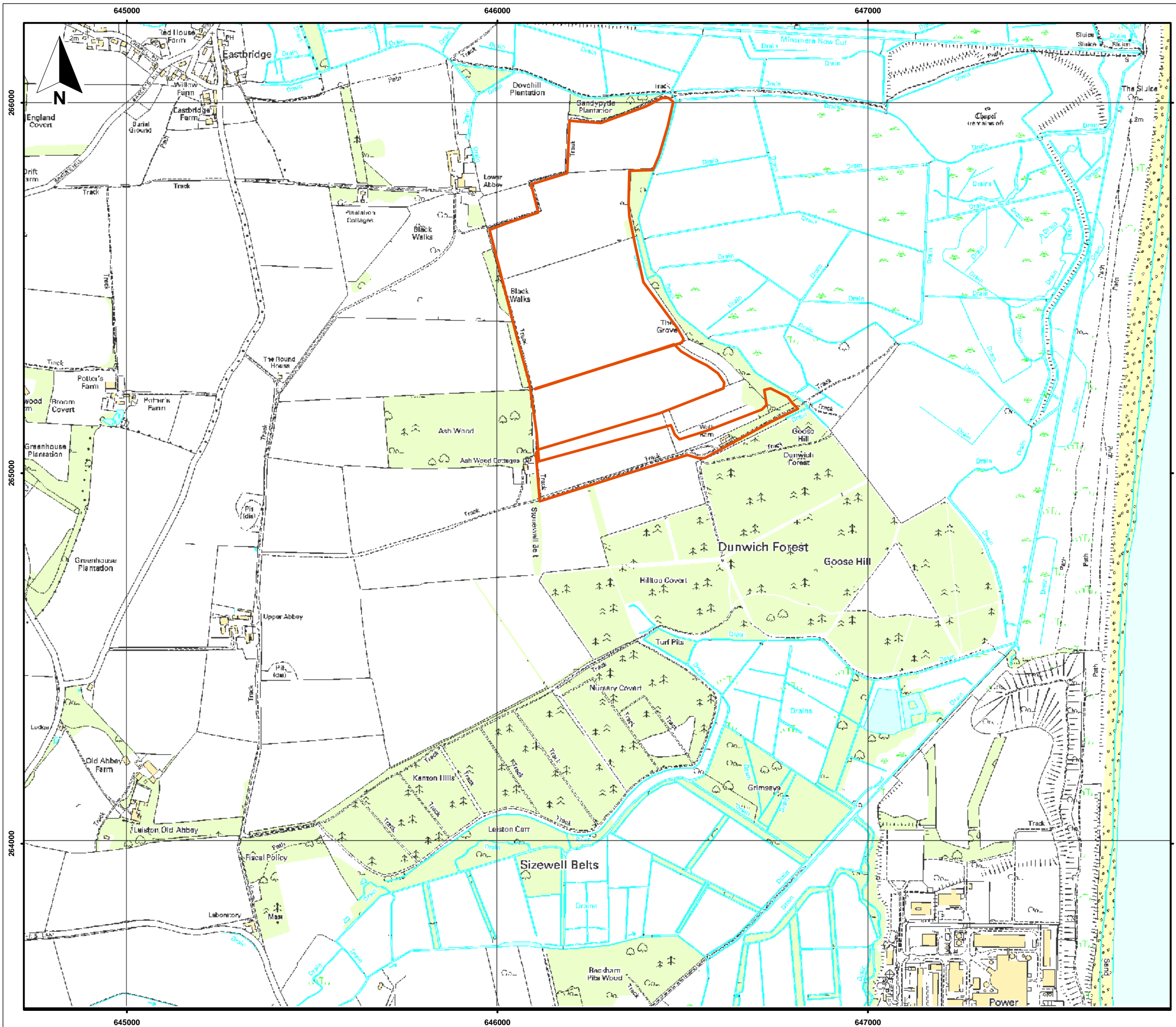
Sizewell Bat Report 2011

Figure D5
 Walked transect route 4 May

January 2011
 28130-A283.mxd tugwc



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Key:
— Transect 5
 7th June

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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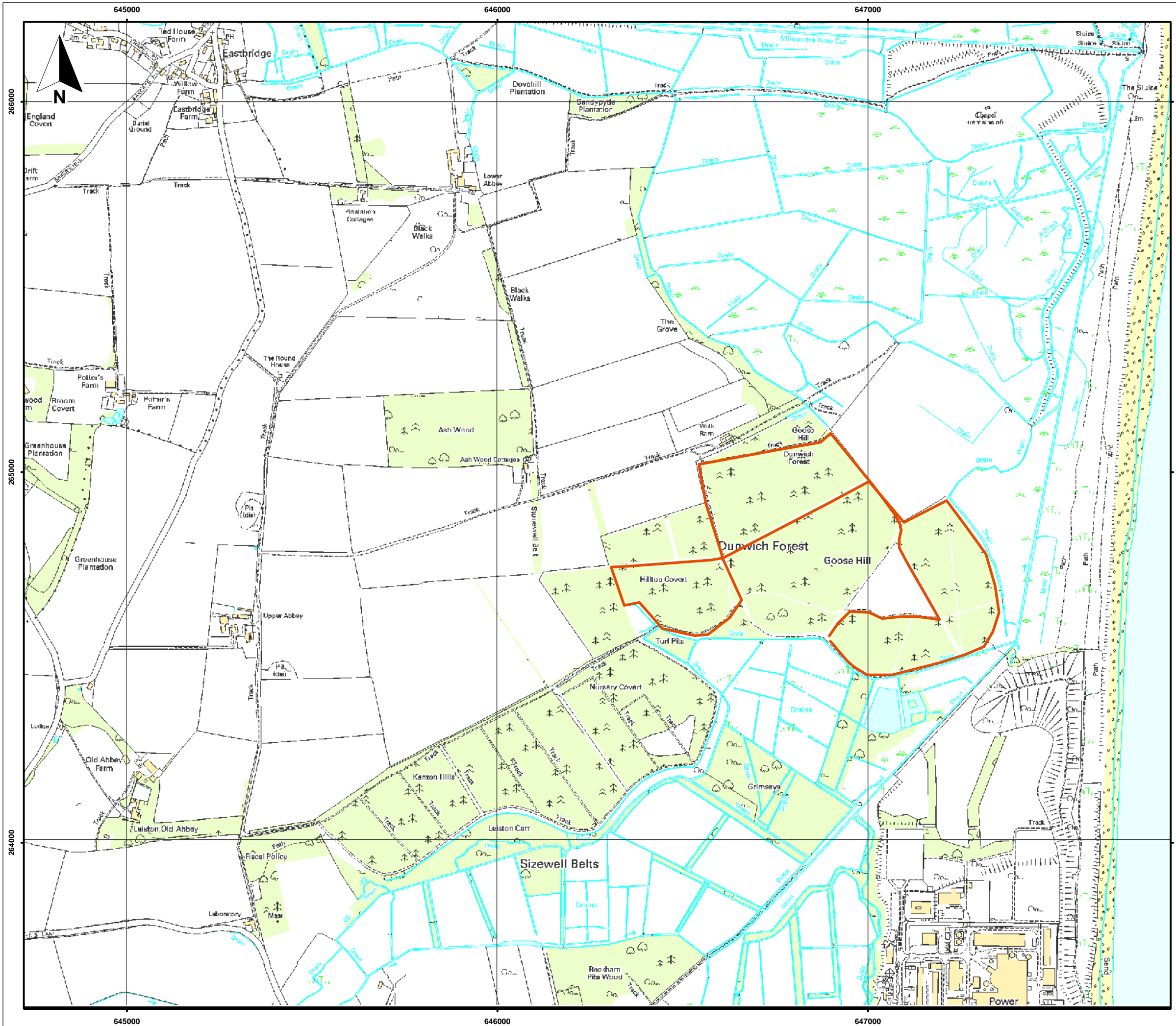
Sizewell Bat Report 2011

Figure D6
 Walked transect route 5 June

January 2011
 28130-A284.mxd tugwc



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Key:
— Transect 6
 21st June

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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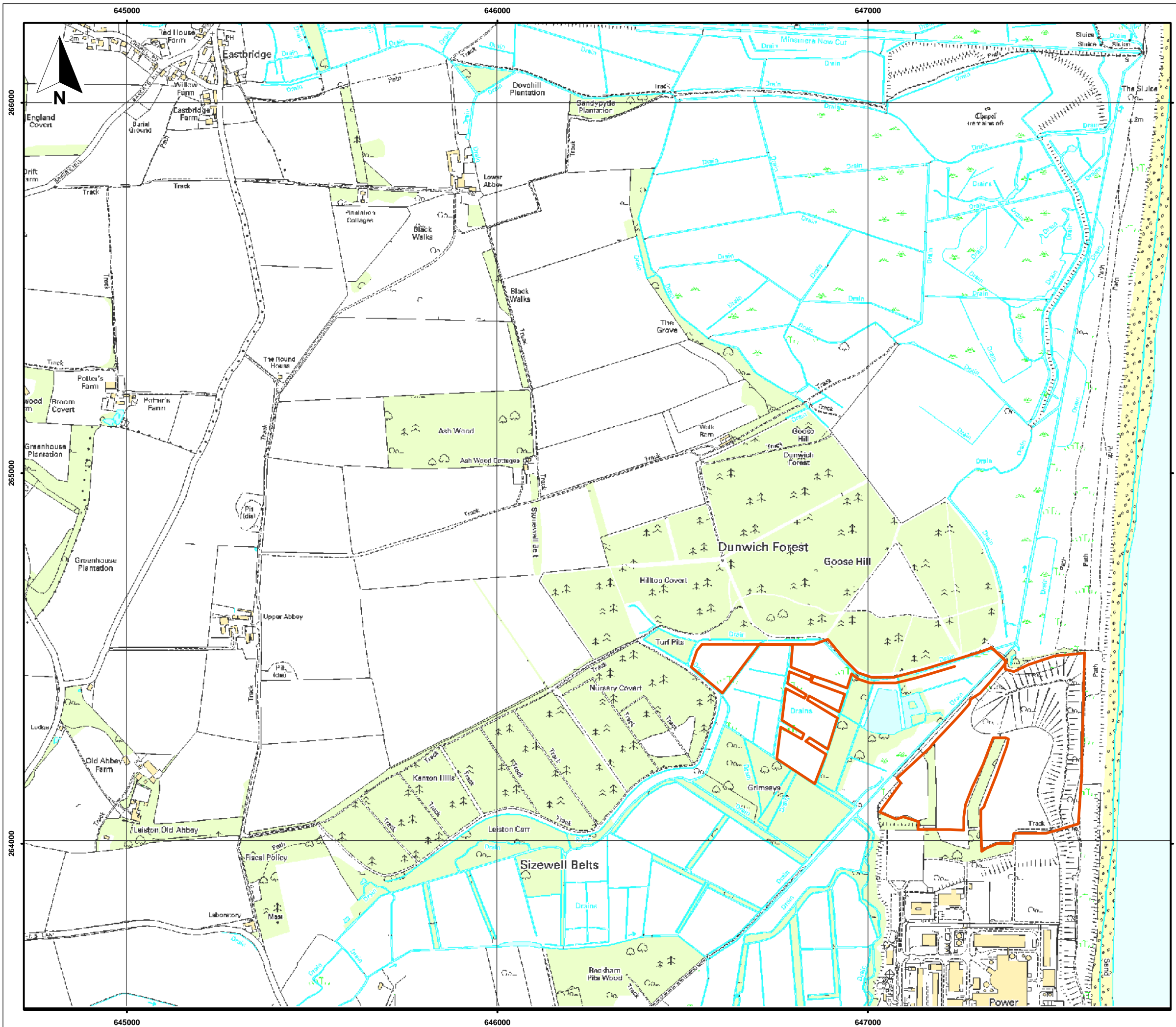
Sizewell Bat Report 2011

Figure D7
 Walked transect route 6 June

January 2011
 28130-A285.mxd tugwc

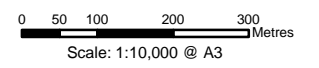


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Key:

— Transect 7
4th July



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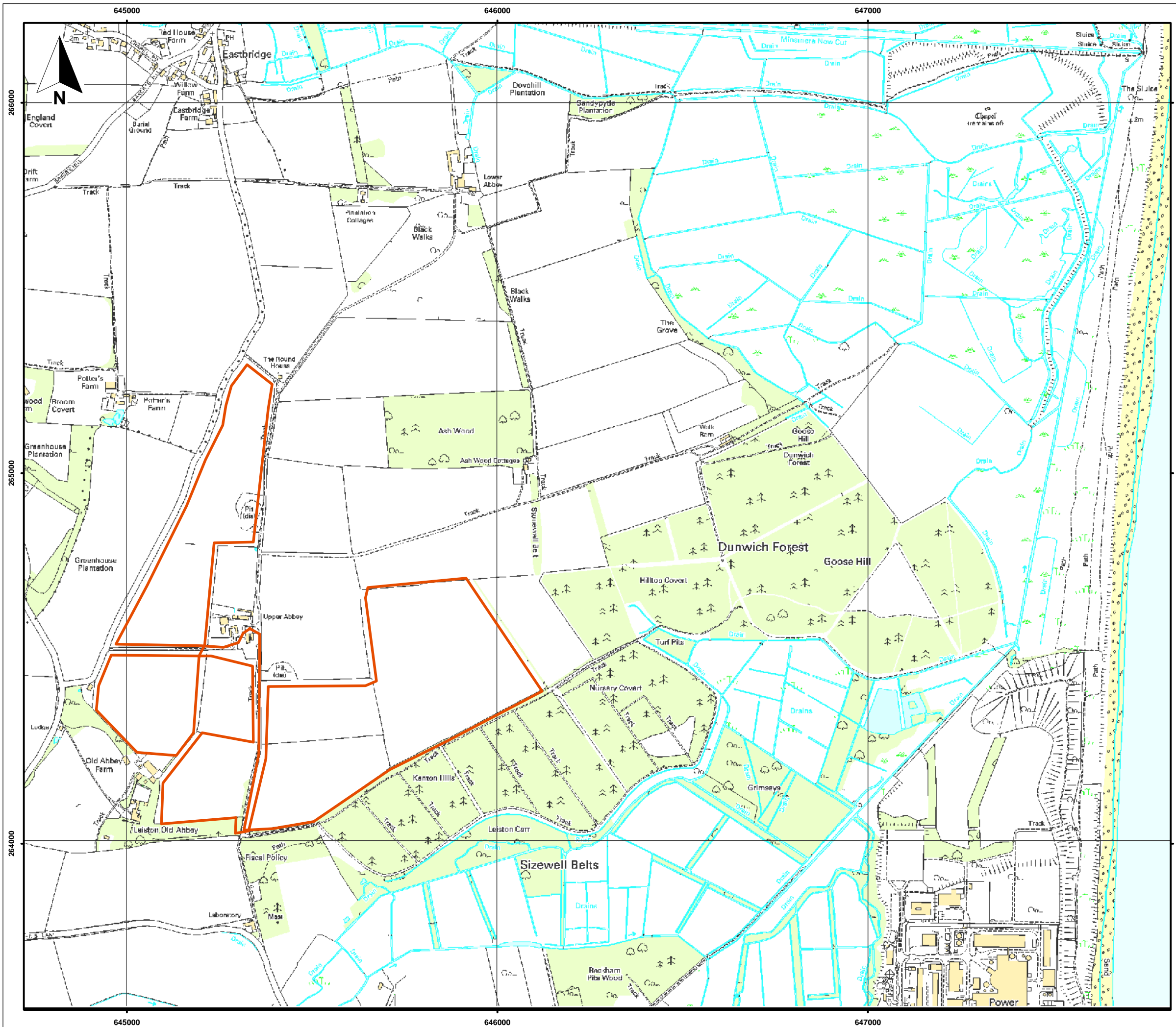
Sizewell Bat Report 2011

Figure D8
Walked transect route 7 July

January 2011
28130-A286.mxd tugwc



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Key:
— Transect 8
 18th July

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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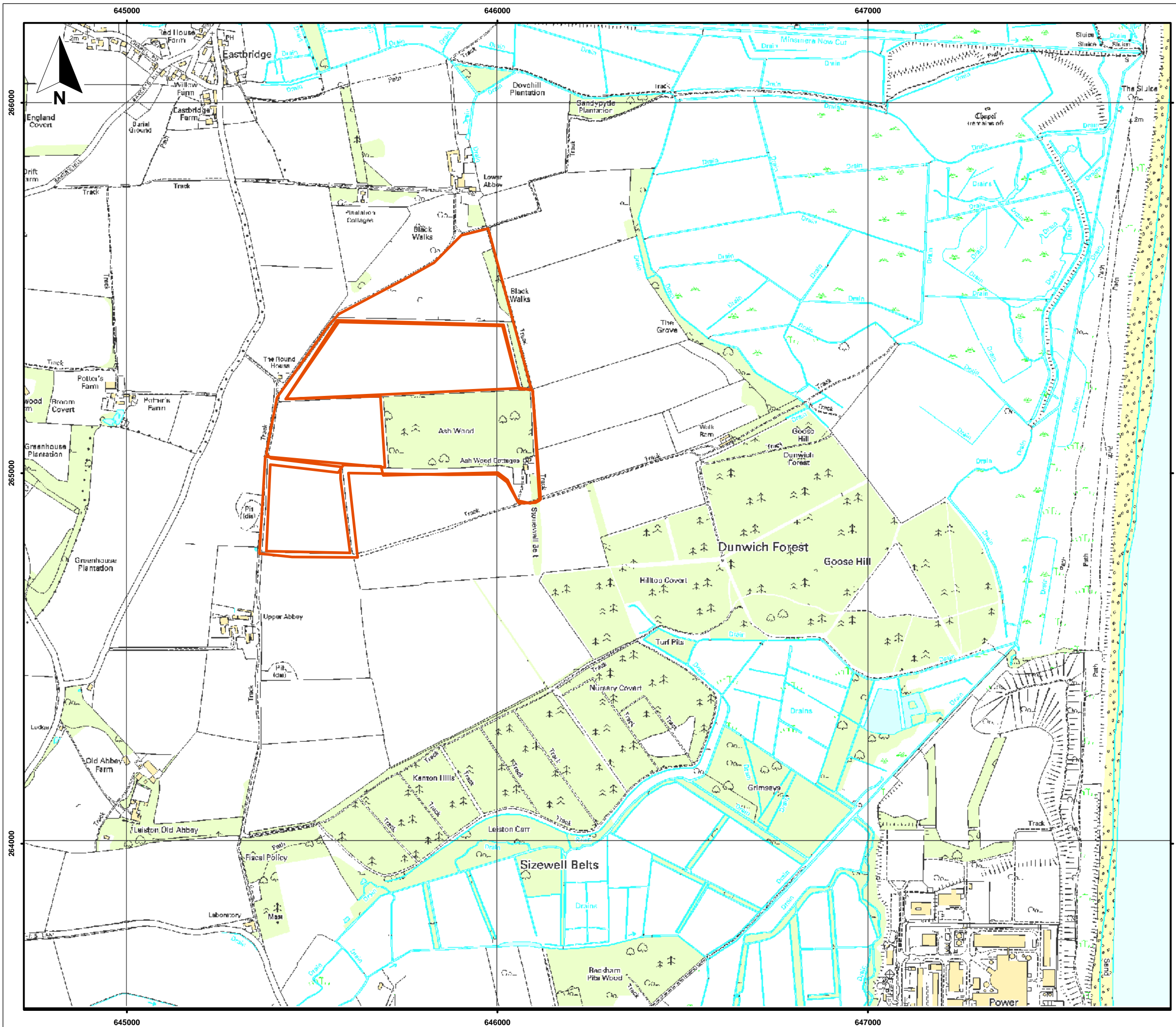
Sizewell Bat Report 2011

Figure D9
 Walked transect route 8 July

January 2011
 28130-A287.mxd tugwc



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Key:
— Transect 9
 1st August

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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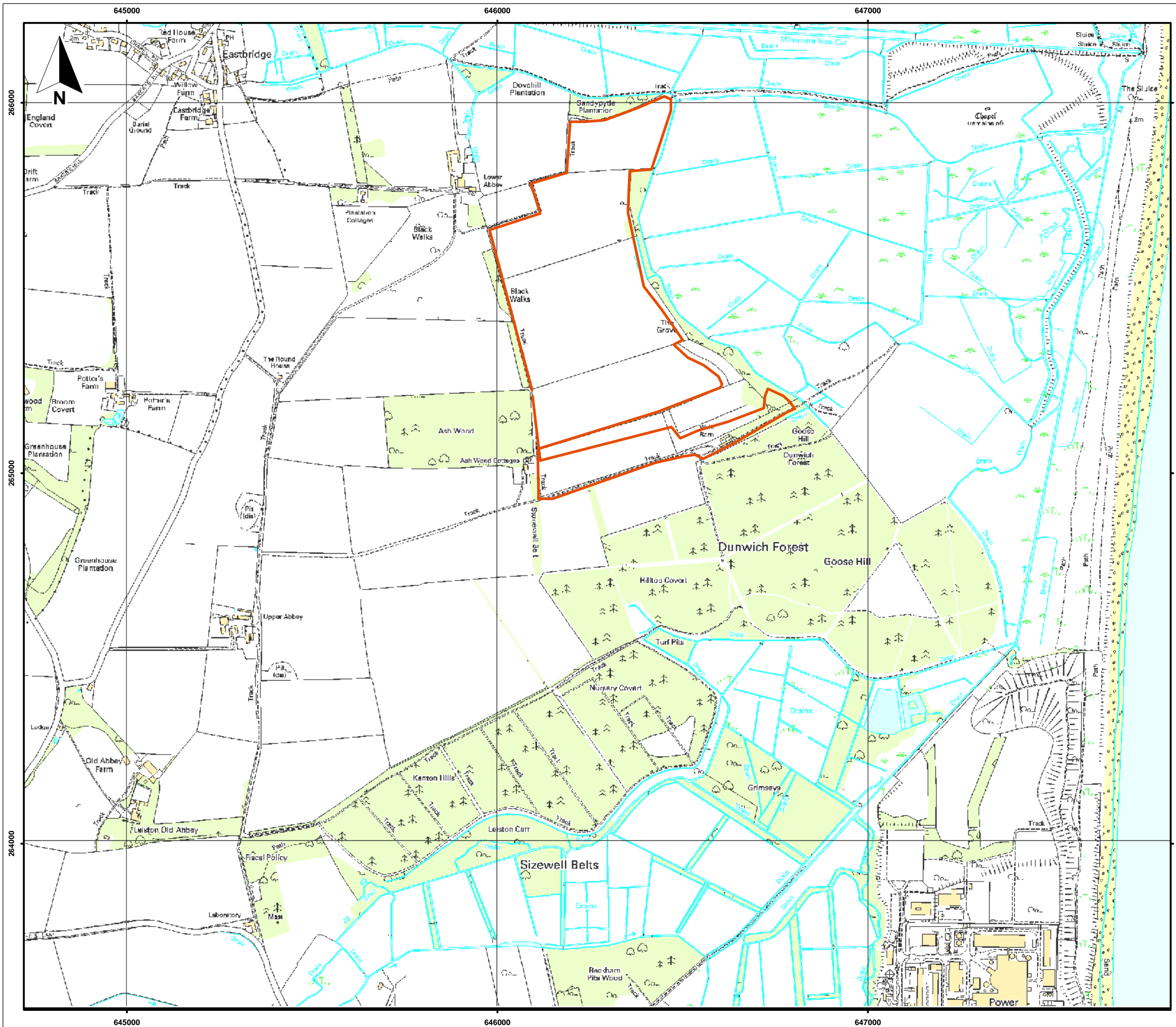
Sizewell Bat Report 2011

Figure D10
 Walked transect route 9 August

January 2011
 28130-A288.mxd tugwc



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Key:
— Transect 10
 22nd August

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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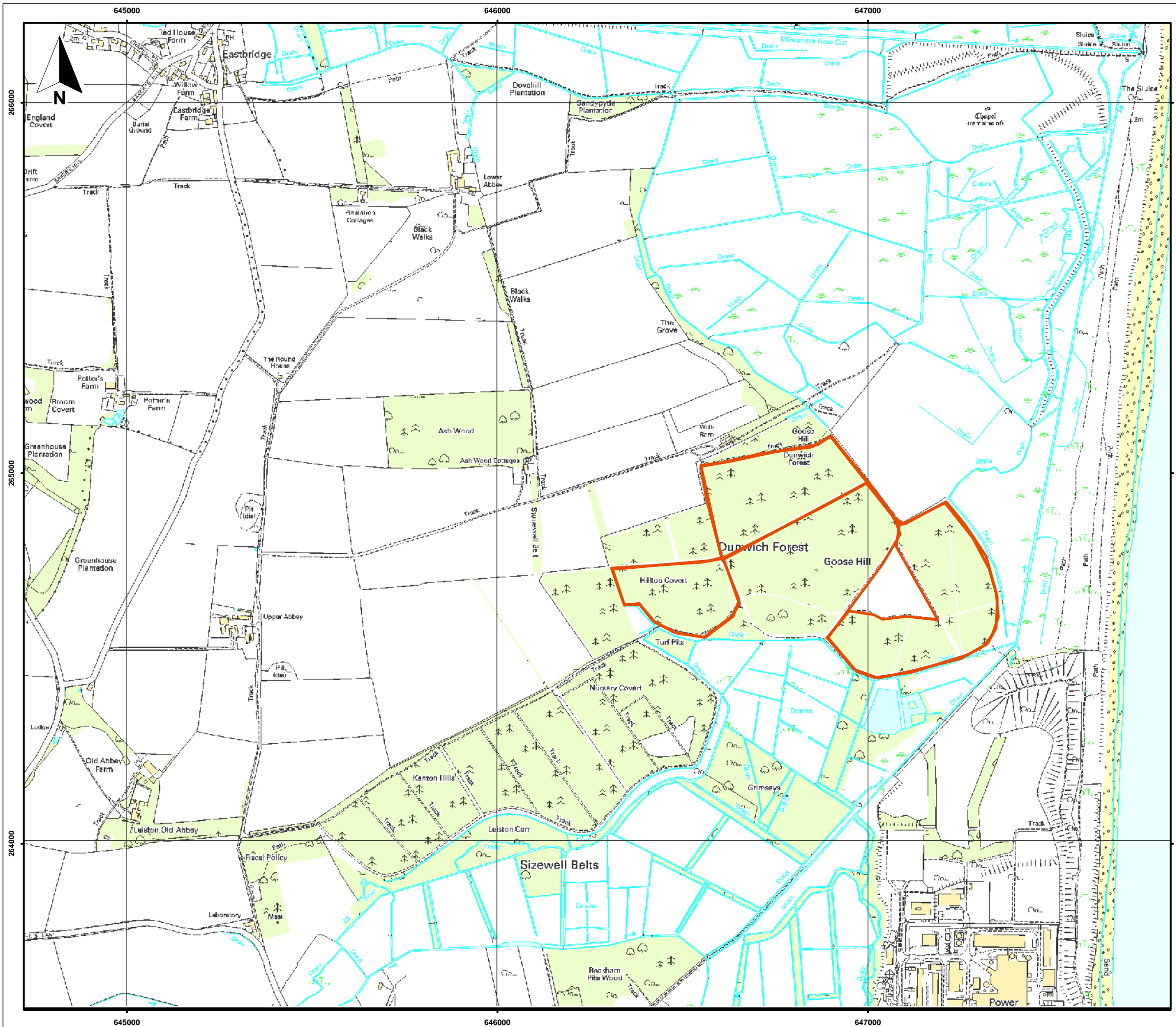
Sizewell Bat Report 2011

Figure D11
 Walked transect route 10 August

January 2011
 28130-A289.mxd tugwc



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Key:
— Transect 11
 6th September

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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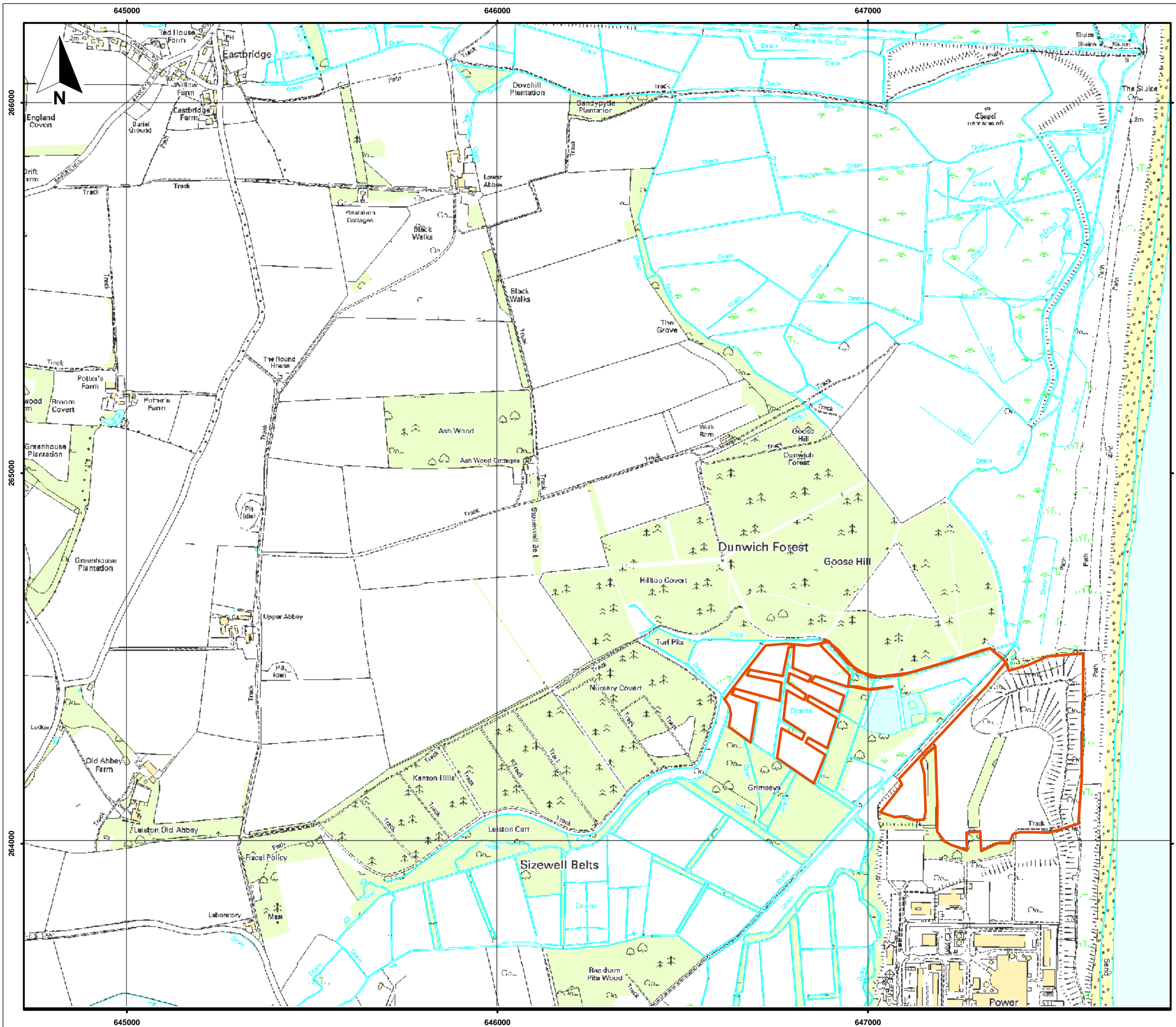
Sizewell Bat Report 2011

Figure D12
 Walked transect route 11 September

January 2011
 28130-A290.mxd tugwc



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Key:
— Transect 12
 29th September

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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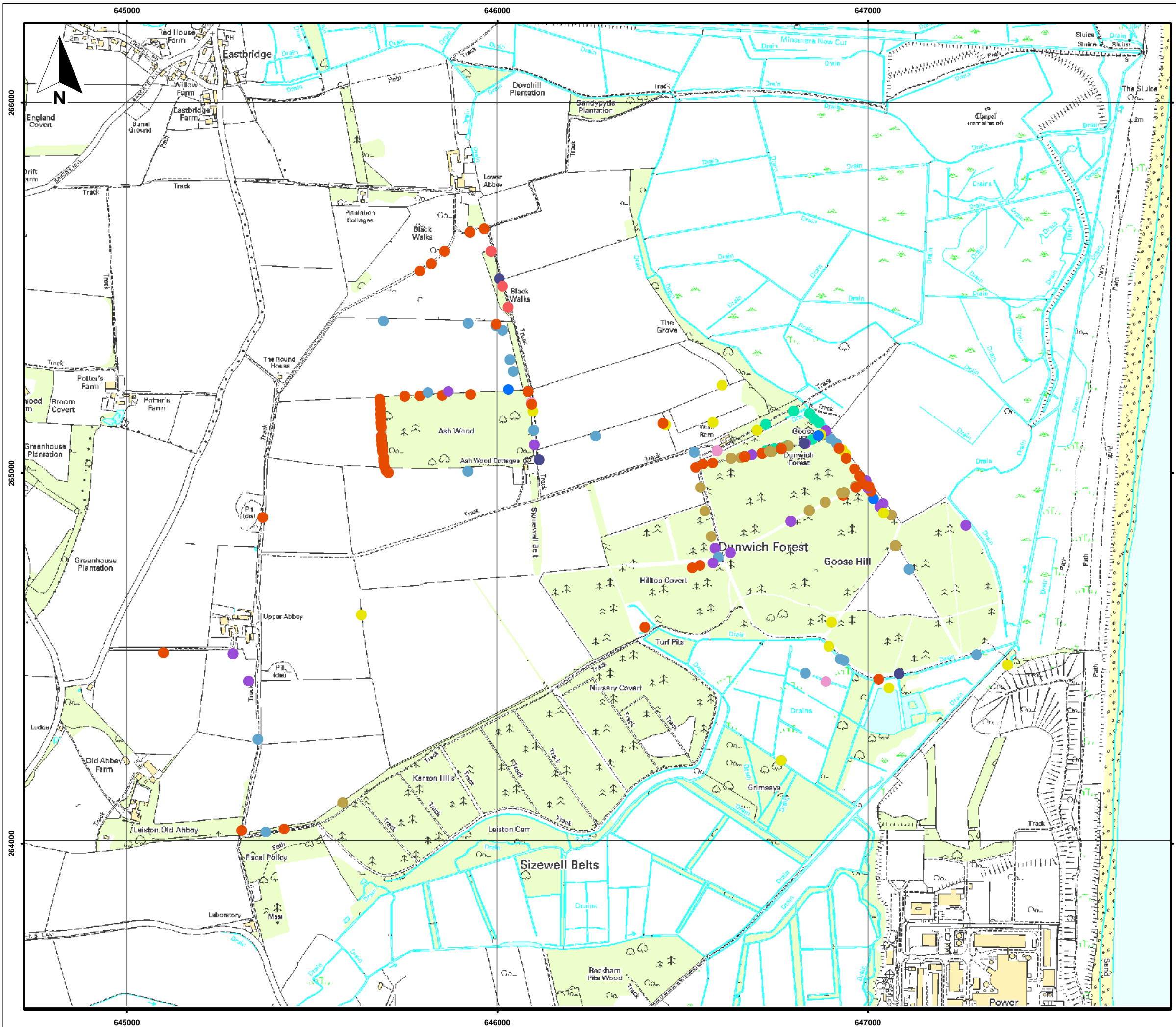
Sizewell Bat Report 2011

Figure D13
 Walked transect route 12 September

January 2011
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- Key:**
- Barbastelle
 - Leisler's bat
 - Nathusius' pipistrelle
 - Brown long-eared bat
 - *Myotis* sp.
 - *Myotis* sp./brown long-eared bat
 - Noctule
 - *Nyctalus* sp.
 - Serotine
 - Serotine/Leisler's bat

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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Sizewell Bat Report 2011

Figure D14
Bat pass locations - walked transect surveys

January 2011
28130-A292.mxd tugwc



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Appendix E

Static Bat Detector Survey Results

Table E1 Static Detector Dates and Locations. The table also lists the three dates analysed from each deployment for Group 2 species.

Period	Static	Location	Area name	Start	Finish	Nights	Dates analysed for Group 2 bats
1	1a	Stonewall Belt S	4.Goose Hill	12/04/2011	25/04/2011	14	12, 19 and 22 April
1	1b	Hilltop Covert SW	4.Goose Hill	13/04/2011	25/04/2011	13	19, 20 and 21 April
1	1c	Goose Hill W	4.Goose Hill	NA	NA	0	NA
1	1d	Goose Hill NE	4.Goose Hill	13/04/2011	25/04/2011	13	13, 14 and 19 April
1	1e	Goose Hill E	4.Goose Hill	13/04/2011	25/04/2011	13	19, 24 and 25 April
1	1f	Goose Hill SE	4.Goose Hill	13/04/2011	25/04/2011	13	14, 24 and 25 April
1	2a	SSSI willows	5. Belts etc.	26/04/2011	09/05/2011	14	7, 8 and 9 May
1	2b	SSSI birches	5. Belts etc.	26/04/2011	09/05/2011	14	26, 27 and 29 April
1	2c	NE Belts	5. Belts etc.	26/04/2011	09/05/2011	14	30 April, 1 and 7 May
1	2d	Belts S	5. Belts etc.	26/04/2011	09/05/2011	14	5, 8 and 9 May
1	2e	Main site tree line	5. Belts etc.	27/04/2011	09/05/2011	13	1, 4 and 6 May
1	2f	Power station bund	5. Belts etc.	27/04/2011	09/05/2011	12	7, 8 and 9 May
1	3a	NW of Upper Abbey	3. Arable south	10/05/2011	22/05/2011	13	10, 11 and 19 May
1	3b	NE of Old Abbey Farm	3. Arable south	10/05/2011	22/05/2011	13	20, 21 and 22 May
1	3c	E of Leiston Old Abbey	3. Arable south	10/05/2011	22/05/2011	13	15, 16 and 21 May
1	3d	Upper Abbey track S	3. Arable south	10/05/2011	22/05/2011	13	20, 21 and 22 May
1	3e	N/S hedge	3. Arable south	10/05/2011	22/05/2011	13	17, 18 and 20 May
1	3f	Tree line in arable	3. Arable south	10/05/2011	22/05/2011	10	10, 17 and 18 May



Period	Static	Location	Area name	Start	Finish	Nights	Dates analysed for Group 2 bats
1	4a	Edge of Black Walks	1.Arable NW	23/05/2011	06/06/2011	15	25 May, 3 and 4 June
1	4b	N edge Ash Wood	1.Arable NW	23/05/2011	06/06/2011	15	24 and 28 May, 1 June
1	4c	Ash cottage track	1.Arable NW	23/05/2011	06/06/2011	15	26 May, 1 and 6 June
1	4d	S edge Ash Wood	1.Arable NW	23/05/2011	06/06/2011	15	1, 3 and 6 June
1	4e	SW of Ash Wood	1.Arable NW	23/05/2011	06/06/2011	15	24, 26 and 28 May
1	4f	Upper Abbey Track N	1.Arable NW	23/05/2011	06/06/2011	15	23, 26 and 28 May
1	5a	N end of Grove	2.Arable NE	07/06/2011	19/06/2011	13	9, 10 and 18 June
1	5b	H east of Ash Wood	2.Arable NE	07/06/2011	19/06/2011	13	13, 14 and 15 June
1	5c	N edge of plantation	2.Arable NE	07/06/2011	19/06/2011	13	11, 40 and 16 June
1	5d	Ride through plantation	2.Arable NE	07/06/2011	19/06/2011	13	14, 50 and 19 June
1	5e	Track east of Walk Barn	2.Arable NE	07/06/2011	19/06/2011	13	7, 20 and 15 June
1	5f	The Grove	2.Arable NE	07/06/2011	19/06/2011	13	7, 8 and 10 June
2	1a	South end stonewall belt	4.Goose Hill	20/06/2011	03/07/2011	14	25 and 26 June, 3 July
2	1b	South west Hilltop Covert	4.Goose Hill	20/06/2011	03/07/2011	14	28 June, 1 and 2 July
2	1c	West Goose Hill	4.Goose Hill	20/06/2011	03/07/2011	14	20, 25 and 26 June
2	1d	North east Goose Hill	4.Goose Hill	20/06/2011	03/07/2011	14	21, 24 and 25 June
2	1e	East central Goose Hill	4.Goose Hill	20/06/2011	03/07/2011	14	25 June, 2 and 3 July
2	1f	South east Goose Hill	4.Goose Hill	20/06/2011	03/07/2011	14	26, 27 and 28 June
2	2a	SSSI mound	5. Belts etc.	04/07/2011	17/07/2011	14	6, 8 and 15 July
2	2b	SSSI birches	5. Belts etc.	04/07/2011	17/07/2011	14	12, 13 and 16 July
2	2c	NE Belts	5. Belts etc.	04/07/2011	17/07/2011	14	6, 9 and 12 July
2	2d	Southern Belts	5. Belts etc.	04/07/2011	17/07/2011	14	4, 8 and 15 July
2	2e	Main site tree line	5. Belts etc.	04/07/2011	17/07/2011	14	5, 7 and 10 July
2	2f	Power station bund	5. Belts etc.	04/07/2011	17/07/2011	14	5, 7 and 10 July
2	3a	NW of Upper Abbey	3. Arable south	NA	NA	0	NA



Period	Static	Location	Area name	Start	Finish	Nights	Dates analysed for Group 2 bats
2	3b	NE of Old Abbey Farm	3. Arable south	19/07/2011	31/07/2011	13	19, 23 and 31 July
2	3c	East of Leiston Old Abbey	3. Arable south	19/07/2011	31/07/2011	13	25, 26 and 27 July
2	3d	Upper Abbey track	3. Arable south	19/07/2011	31/07/2011	13	22, 23 and 25 July
2	3e	N/S hedge	3. Arable south	19/07/2011	31/07/2011	13	24, 25 and 26 July
2	3f	Tree line in arable	3. Arable south	19/07/2011	31/07/2011	13	19, 27 and 31 July
2	4a	Edge of Black Walks	1.Arable NW	02/08/2011	21/08/2011	20	4, 19 and 21 August
2	4b	N edge Ash Wood	1.Arable NW	02/08/2011	21/08/2011	20	16, 17 and 21 August
2	4c	E edge Ash Wood	1.Arable NW	24/08/2011	05/09/2011	13	29 and 30 August, 3 September
2	4d	S edge Ash Wood	1.Arable NW	06/09/2011	29/09/2011	19	6, 22 and 24 September
2	4e	SW of Ash Wood	1.Arable NW	06/09/2011	29/09/2011	23	14, 17 and 20 September
2	4f	N Upper Abbey Track	1.Arable NW	06/09/2011	29/09/2011	23	07, 12 and 13 September
2	5a	N end of Grove	2.Arable NE	22/08/2011	05/09/2011	15	29 and 30 August, 5 September
2	5b	H east of Ash Wood	2.Arable NE	22/08/2011	05/09/2011	15	22, 23 and 24 August
2	5c	N edge of plantation	2.Arable NE	22/08/2011	27/08/2011	6	24, 25 and 26 August
2	5d	Ride through plantation	2.Arable NE	22/08/2011	05/09/2011	15	25 August, 2 and 4 September
2	5e	Track east of Walk Barn	2.Arable NE	22/08/2011	05/09/2011	15	22 and 30 August, 5 September
2	5f	The Grove	2.Arable NE	22/08/2011	05/09/2011	15	22 and 30 August, 1 September
3	1a	SSSI mound	5. Belts etc.	06/09/2011	19/09/2011	14	9, 11 and 12 September
3	1b	SSSI birches	5. Belts etc.	06/09/2011	22/09/2011	17	6, 11 and 12 September
3	1c	NE Belts	5. Belts etc.	06/09/2011	28/09/2011	23	11, 15 and 16 September
3	1d	Southern Belts	5. Belts etc.	NA	NA	0	NA
3	1e	Main site tree line	5. Belts etc.	06/09/2011	29/09/2011	17	7, 26 and 28 September
3	1f	Power station bund	5. Belts etc.	06/09/2011	22/09/2011	23	8, 9 and 18 September
3	1g	Northern bund	5. Belts etc.	06/09/2011	28/09/2011	23	9, 14 and 18 September



Table E2 Static bat detector deployment codes, minimum number of species recorded at each and relative activity rate for bats (B/h) recorded at each location³³.

Period	Static	Minimum no. species	Area	Group 1 species			Group 2 species							
				Barbastelle	Leislars	Pip-nat	Myotis	Noctule	ser/Lei	BLE	Pip45	Pip55	Serotine	
1	1a	7	4	0.26		0.26	0.07	0.03		0.10	0.03	3.10	8.43	
1	1b	8	4	0.34		0.18	0.28	0.07			0.04	18.42	13.51	0.04
1	1d	7	4	0.42		2.34	1.13	0.34			0.17	54.21	56.44	
1	1e	7	4	0.02		0.70	0.79	0.61			0.07	12.96	5.65	
1	1f	7	4	0.06		0.32	0.53	0.95			0.04	6.23	2.67	
1	2a	6	5	0.01		0.19	0.20			0.04	0.04	2.35	12.38	
1	2b	5	5	0.01		0.10	0.60					51.44	92.01	
1	2c	8	5	0.81		6.72	5.57	0.12			0.08	212.44	149.60	0.04
1	2d	7	5	0.11		1.09	0.71	0.59			0.08	5.87	30.18	
1	2e	6	5	0.10		0.78	1.93	0.04				0.62	0.19	
1	2f	4	5		0.01	1.78						1.19	0.16	
1	3a	5	3	0.16		0.05		0.04				5.51	13.89	
1	3b	9	3	1.29	0.40	0.42	0.64	0.34	0.99	0.04	0.04	90.04	14.01	0.60
1	3c	9	3	0.39	1.20	0.27	0.46	2.73	1.64	0.34	0.34	71.81	8.07	0.13
1	3d	8	3	4.73	0.05	0.20	0.13		0.04	0.09	0.09	36.77	39.90	0.09
1	3e	5	3	0.32		0.16	0.04		0.04			1.23	1.69	
1	3f	7	3	0.48		0.42	0.37	0.12		0.08	0.08	24.81	11.83	
1	4a	8	1	3.63	0.09	0.21	0.13	0.99		0.09	0.09	7.79	7.52	

³³ Abbreviations have been used for different bat species/categories as follows: BLE = brown long-eared bat, Pip45 = common pipistrelle, Pip55 = soprano pipistrelle, Pip-nat = Nathusius' pipistrelle, ser/Lei = serotine/Leisler's bat. For barbastelle all data were used to calculate relative activity.



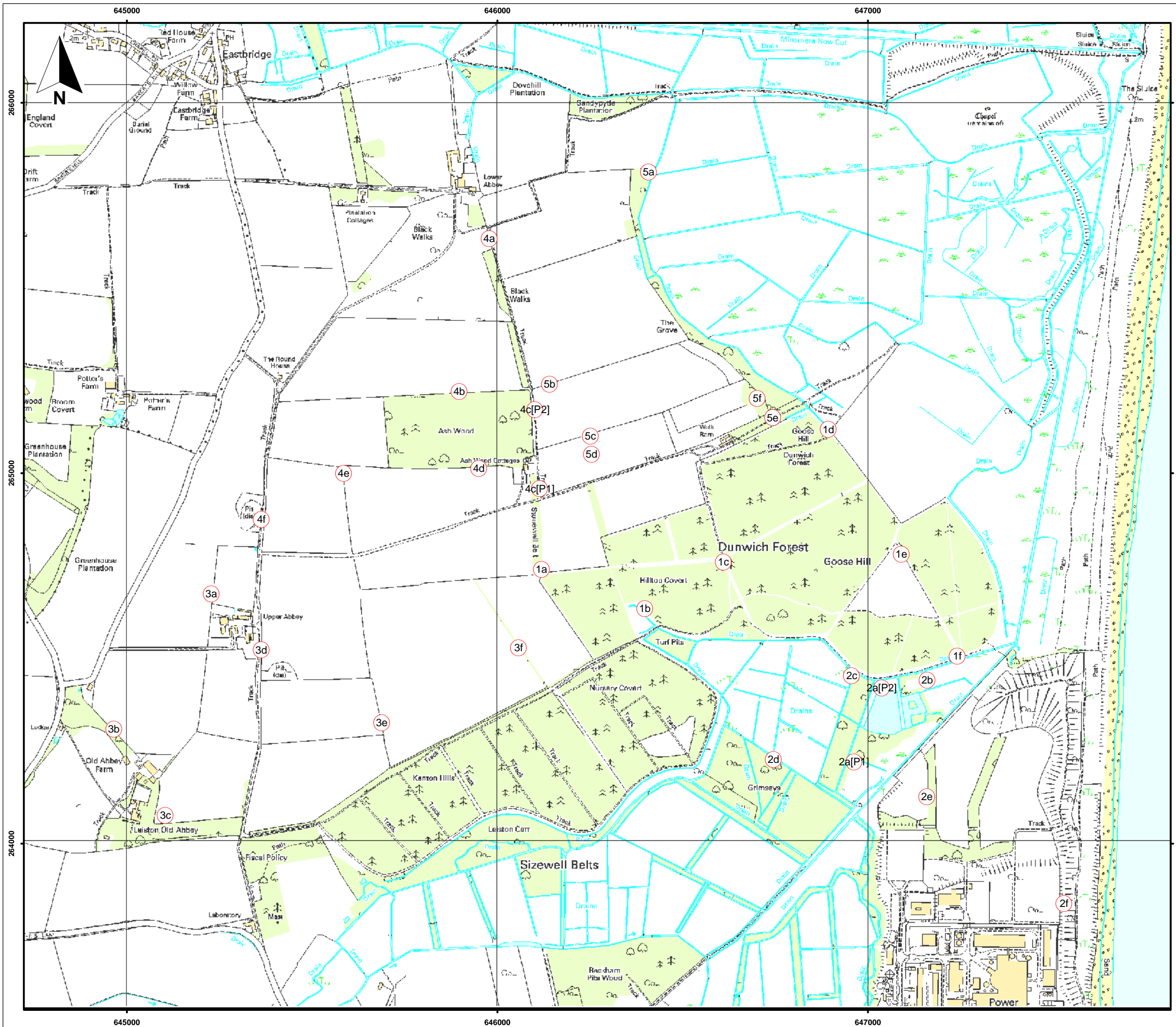
Period	Static	Minimum no. species	Area	Group 1 species			Group 2 species						
				Barbastelle	Leislars	Pip-nat	Myotis	Noctule	ser/Lei	BLE	Pip45	Pip55	Serotine
1	4b	8	1	0.29	0.11	0.09	0.18	0.44		0.04	3.05	1.77	
1	4c	8	1	0.41	0.02	0.11	0.45	0.45		0.04	0.85	16.49	
1	4d	8	1	0.32	0.04	0.11	0.50	1.09			1.67	15.66	0.09
1	4e	7	1	0.53	0.02	0.12	0.09	0.04			7.16	10.85	
1	4f	7	1	2.97		0.02	0.18		0.04	0.18	65.31	62.06	0.13
1	5a	7	2	0.62	0.14	0.11	0.69	0.51			22.76	13.66	
1	5b	8	2	0.13	0.17	0.53	1.06	0.88	0.05	0.18	7.66	24.67	
1	5c	7	2	0.03	0.04	0.01	0.69	0.23	0.18		1.71	0.74	
1	5d	8	2	0.39	0.08	0.02	0.69	0.14	0.18	0.18	0.69	0.92	
1	5e	8	2	0.52		0.02	1.43	12.93	0.18	0.09	5.66	35.57	0.09
1	5f	7	2	0.06		0.01	2.75	0.09		0.05	41.47	107.89	
2	1a	9	4	3.12	1.18	0.02	0.72	0.41	3.44	0.45	8.29	26.13	0.09
2	1b	8	4	1.75	0.31	0.10	0.59	0.72	2.16		0.63	2.34	0.27
2	1c	6	4	0.62	0.17		0.41		0.09		5.72	13.72	0.05
2	1d	8	4	0.54	3.07	0.16	2.15	5.82	0.32	0.23	7.47	21.25	
2	1e	9	4	2.16	0.95	0.01	2.70	9.27	18.00	0.14	14.90	14.36	0.14
2	1f	8	4	0.15	0.56	0.07	0.73	1.73	0.14	0.32	2.73	4.86	
2	2a	9	5	4.74	0.40	0.07	1.43	1.17	0.48	0.04	16.99	32.55	0.13
2	2b	6	5	0.10			1.95	0.04		0.85	1.06	99.77	
2	2c	8	5	0.02	0.09	0.03	1.78	0.30	0.04	0.04	1.65	22.56	
2	2d	7	5	0.06	0.07	0.06	3.04	0.13	0.13		0.30	14.84	
2	2e	7	5	0.00	0.01	0.03	0.39	0.13	0.04	0.09	0.39	0.31	



Period	Static	Minimum no. species	Area	Group 1 species			Group 2 species						
				Barbastelle	Leislars	Pip-nat	Myotis	Noctule	ser/Lei	BLE	Pip45	Pip55	Serotine
2	2f	6	5	0.02		0.11	0.22	0.13	0.04		5.73	0.53	
2	3b	9	3	0.16	0.67	0.01	1.31	1.91	1.83	0.16	10.68	7.73	0.60
2	3c	2	3								7.85	0.59	
2	3d	8	3	0.84	0.14		0.64	0.04	0.20	0.08	16.70	65.14	30.86
2	3e	3	3				0.64		0.04		1.39	2.34	
2	3f	6	3				2.09	0.16	0.16	0.28	6.28	4.66	0.12
2	4a	9	1	3.04	0.23	0.01	2.57	0.21	1.28	0.38	10.54	14.15	0.07
2	4b	9	1	0.73	2.44	0.01	0.34	2.07	6.96	0.61	2.44	2.78	0.07
2	4c	9	1	2.77	0.17	0.05	1.31	0.69	1.25	1.13	38.93	5.91	0.03
2	4d	7	1	0.04		0.01	0.25	0.14		0.25	0.37	0.62	
2	4e	8	1	0.60	0.01	0.01	0.23	0.08		0.17	1.78	3.87	
2	4f	2	1								32.24	1.85	
2	5a	9	2	0.27	0.01	0.10	1.43	0.65	0.37	0.06	15.11	109.94	0.09
2	5b	9	2	5.34	0.01	0.01	0.56	1.18	0.10	0.46	1.22	6.28	0.07
2	5c	8	2	0.10	0.03		0.49	0.29	0.06	0.26	1.36	2.21	0.03
2	5d	7	2	0.06		0.02	0.72	0.13	0.09	0.31	5.07	3.47	
2	5e	9	2	1.26	0.20	0.03	4.17	0.25	0.32	0.44	5.12	30.69	0.06
2	5f	7	2	0.45			10.10	0.03	0.35	0.06	3.34	88.06	0.10
3	1a	8	5	0.38	0.02	0.05	0.59	0.38		0.12	3.05	44.43	
3	1b	4	5	0.01			0.47			0.18		72.65	
3	1c	8	5	0.07	0.01	0.06	1.41	0.49		0.11	15.52	16.73	
3	1e	6	5			0.04	0.22	0.47		0.06	0.42	0.50	



Period	Static	Minimum no. species	Area	Group 1 species			Group 2 species						
				Barbastelle	Leislars	Pip-nat	Myotis	Noctule	ser/Lei	BLE	Pip45	Pip55	Serotine
3	1f	6	5	0.01		0.14	0.20	1.01			0.82	0.82	
3	1g	7	5	1.07		0.14	0.35	0.58		0.12	5.76	7.18	



Key:
 ○ Static locations

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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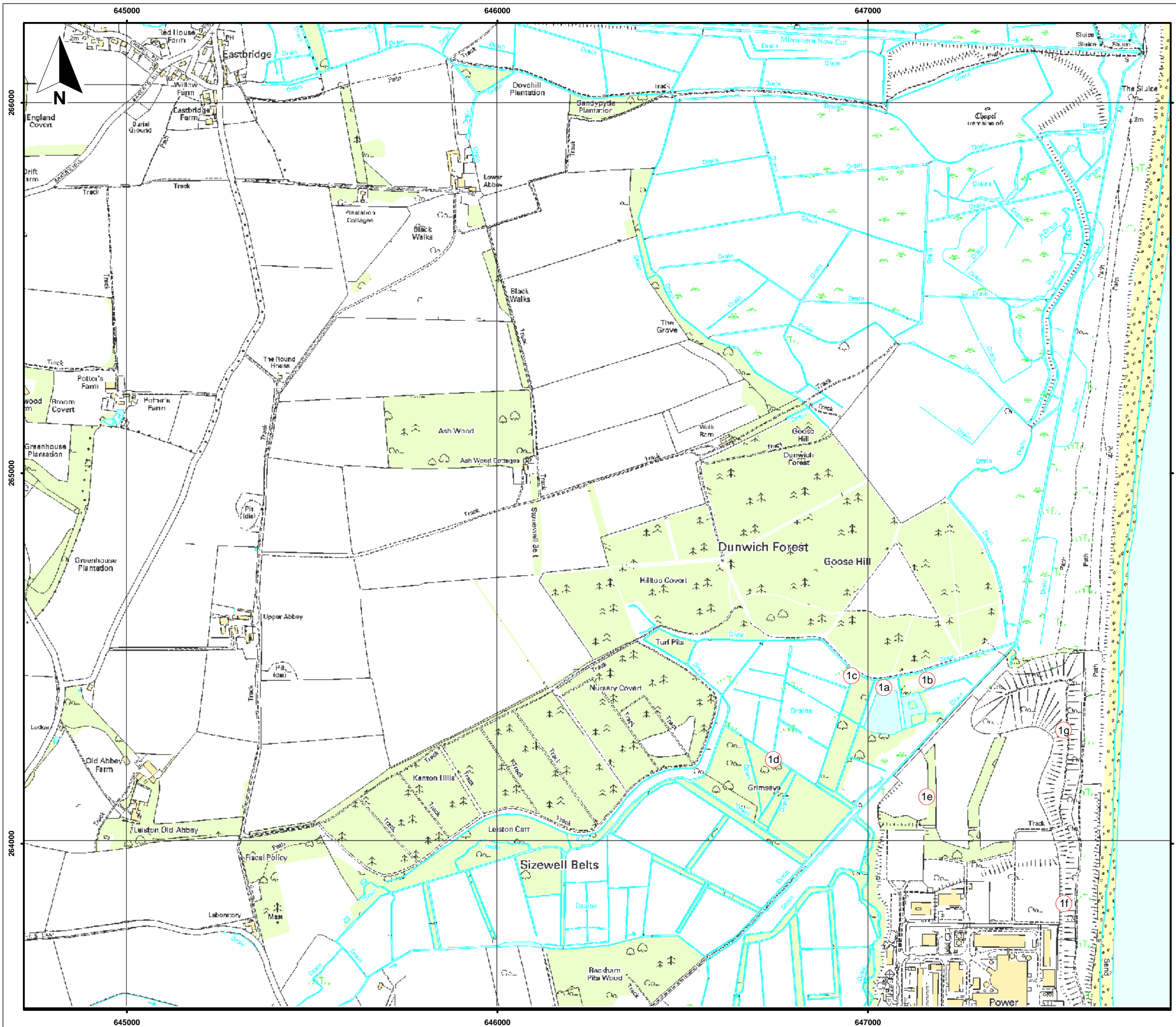
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Figure E1
 Static survey locations in spring and summer

January 2011
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Key:
 ○ Static locations

0 50 100 200 300 Metres
 Scale: 1:10,000 @ A3

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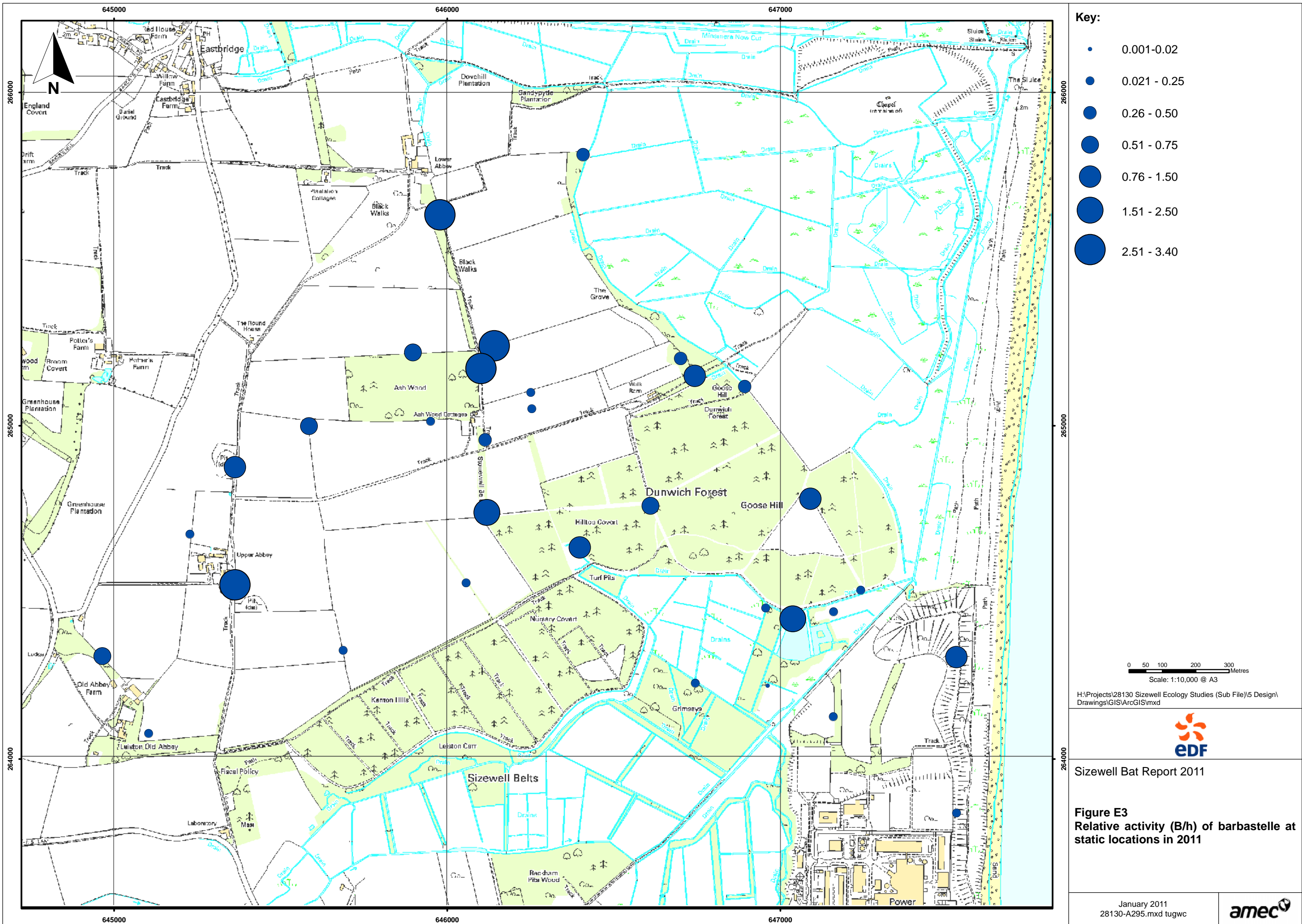
Sizewell Bat Report 2011

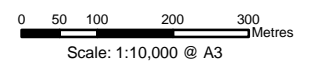
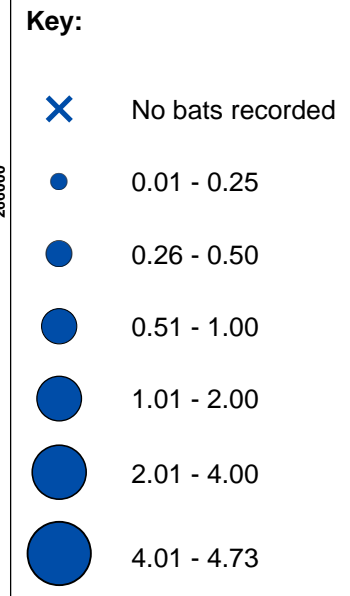
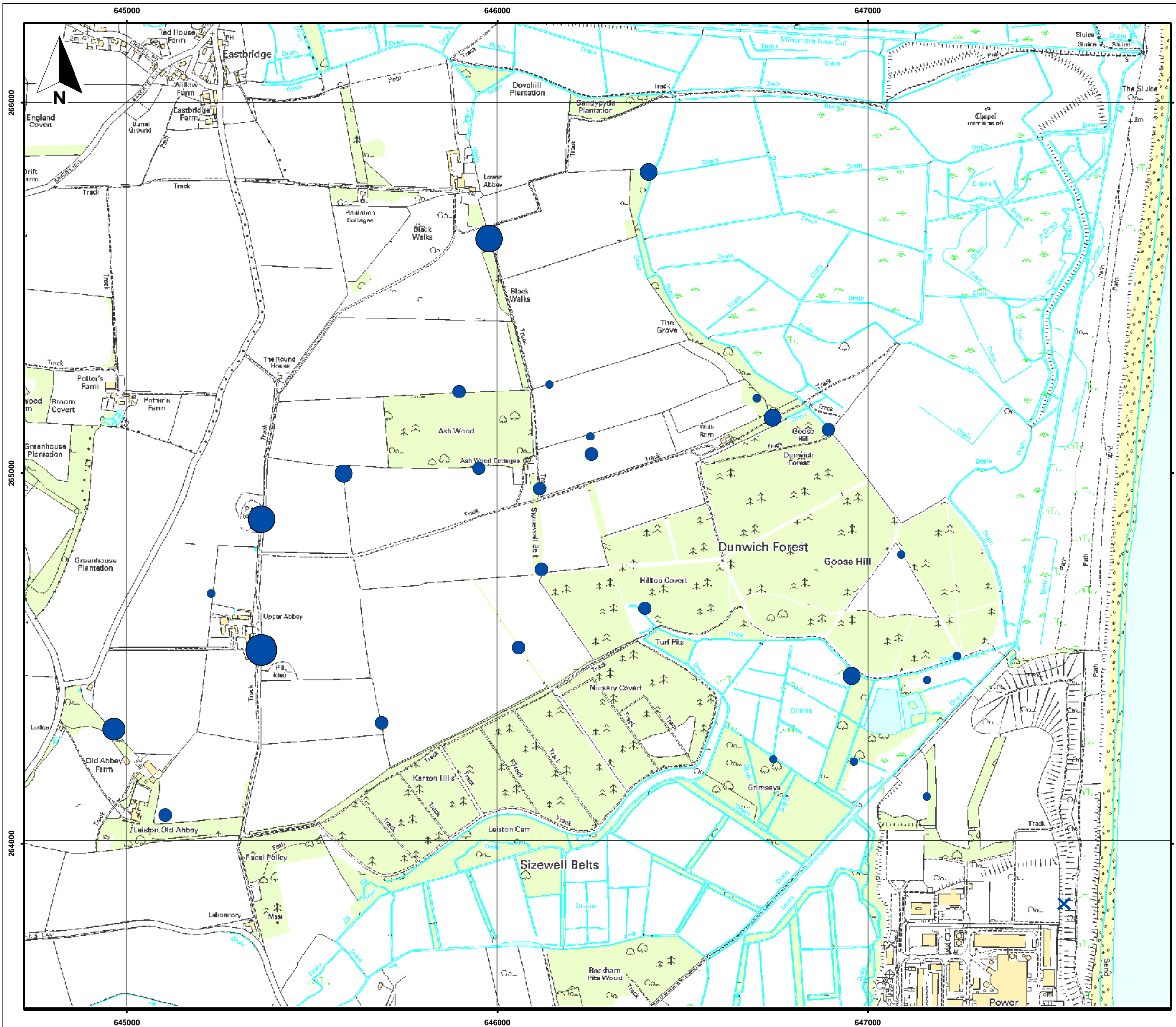
Figure E2
 Static survey locations in autumn

January 2011
 28130-A294.mxd tugwc



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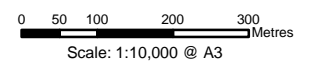
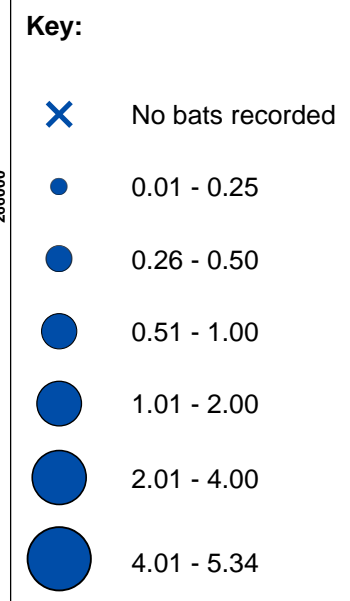
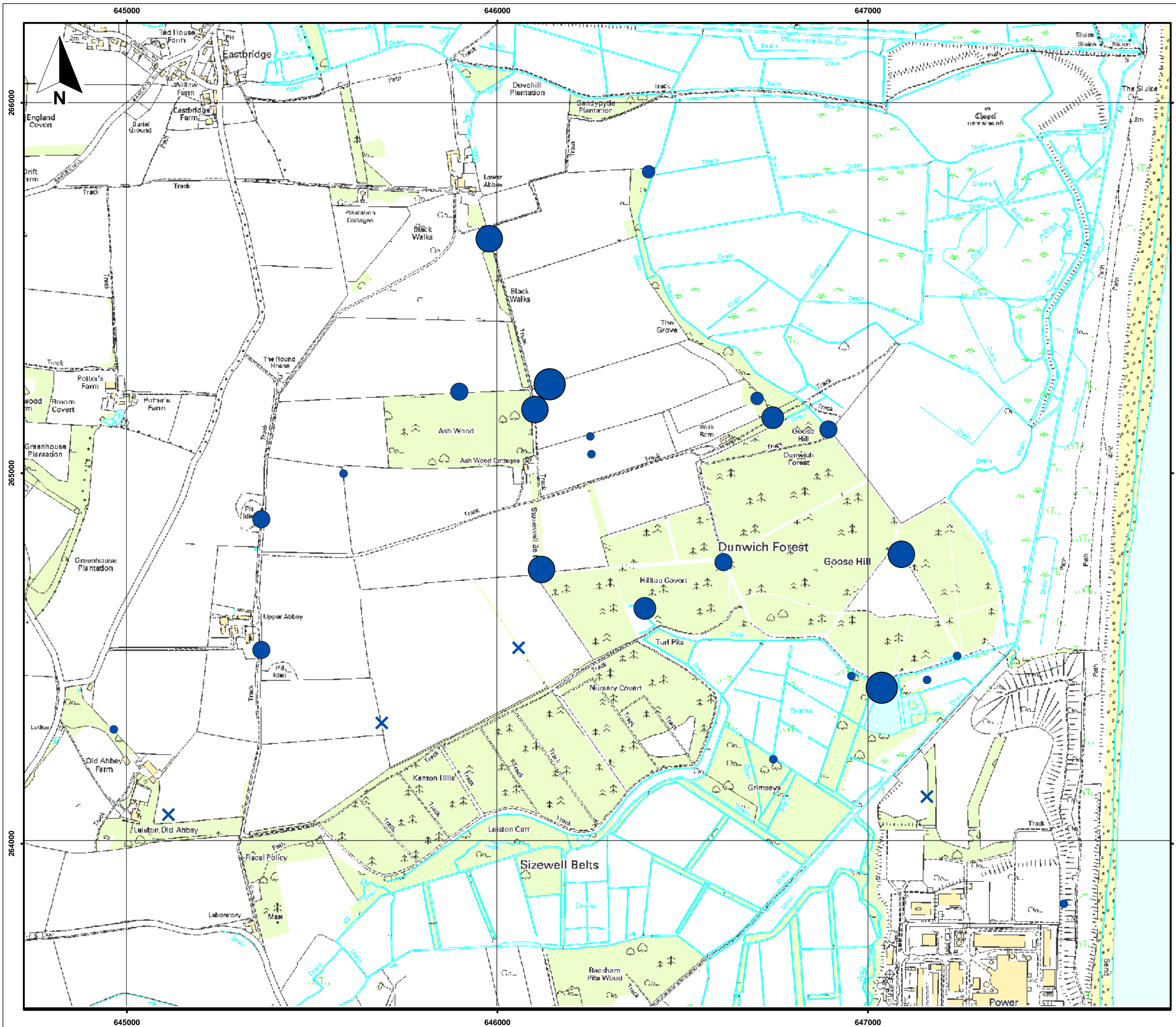
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Figure E4
Relative activity (B/h) of barbastelle at static locations - spring (P1)

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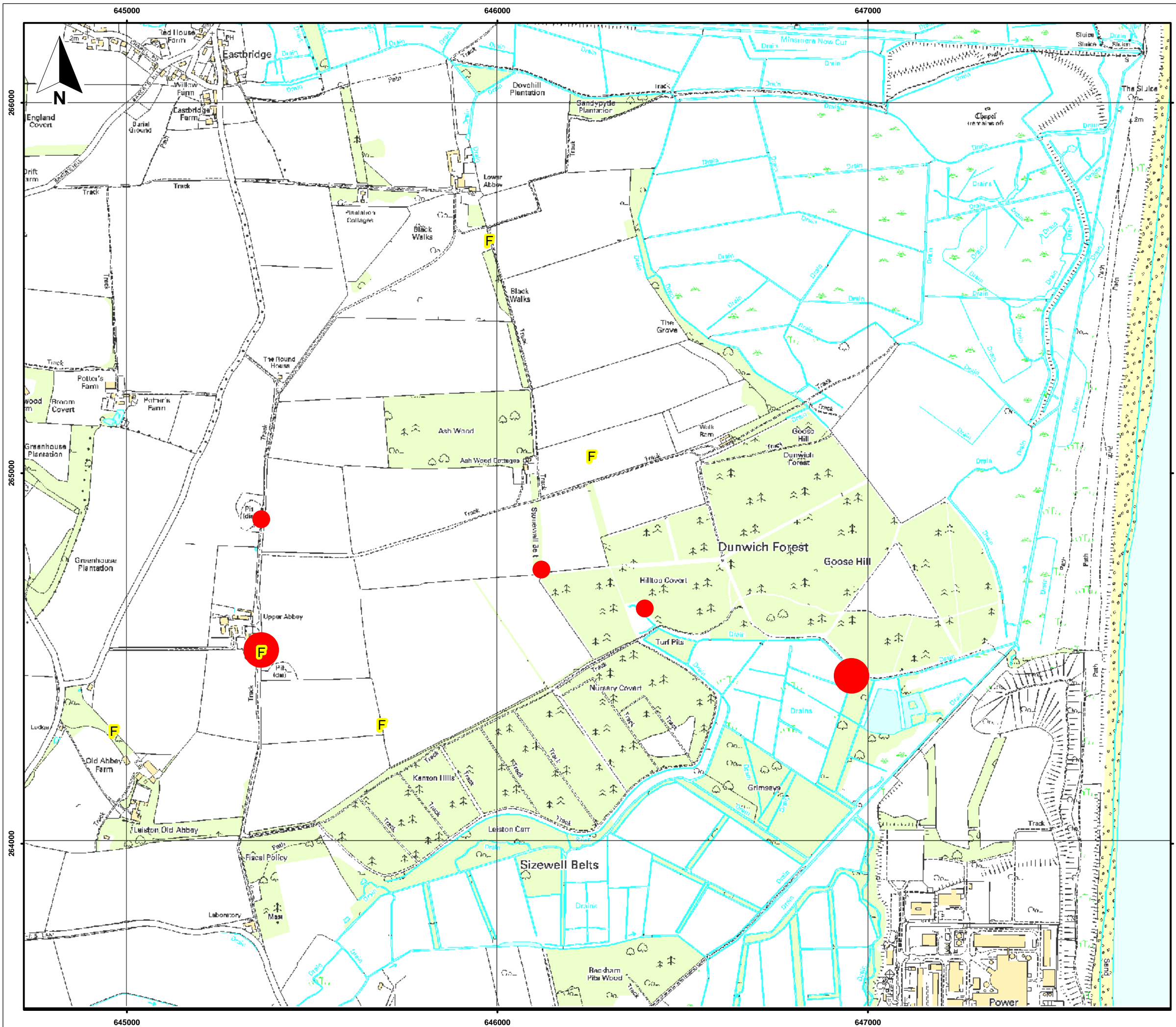
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Figure E5
Relative activity (B/h) of barbastelle at static locations - summer (P2)

January 2011
28130-A297.mxd tugwc



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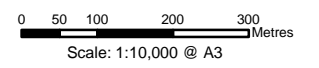
Key:

Early activity within 60 minutes of sunset

- Low
- High

Foraging activity

- F Foraging activity



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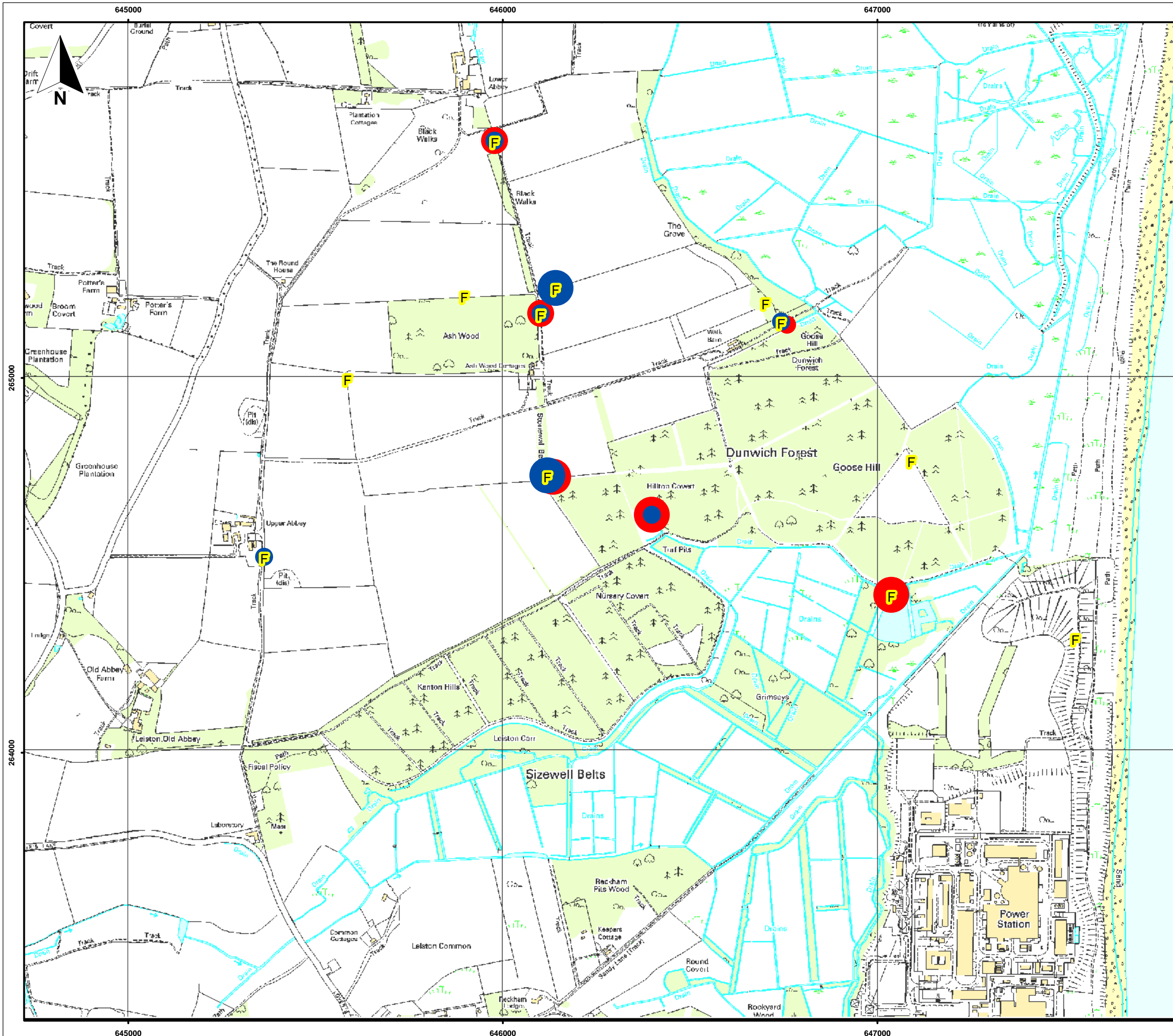
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Figure E6
Barbastelle commuting and foraging activity at static locations in spring (P1)

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Key:

Early activity within 60 minutes of sunset

- Low
- Medium
- High

Late activity within 90 minutes of sunrise

- Low
- High

Foraging activity

- F Foraging activity

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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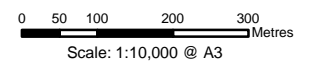
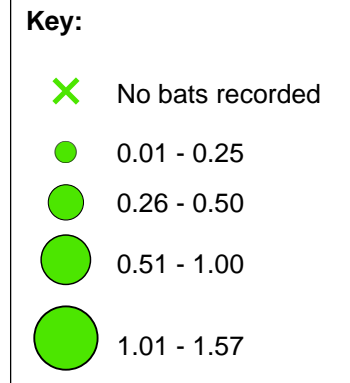
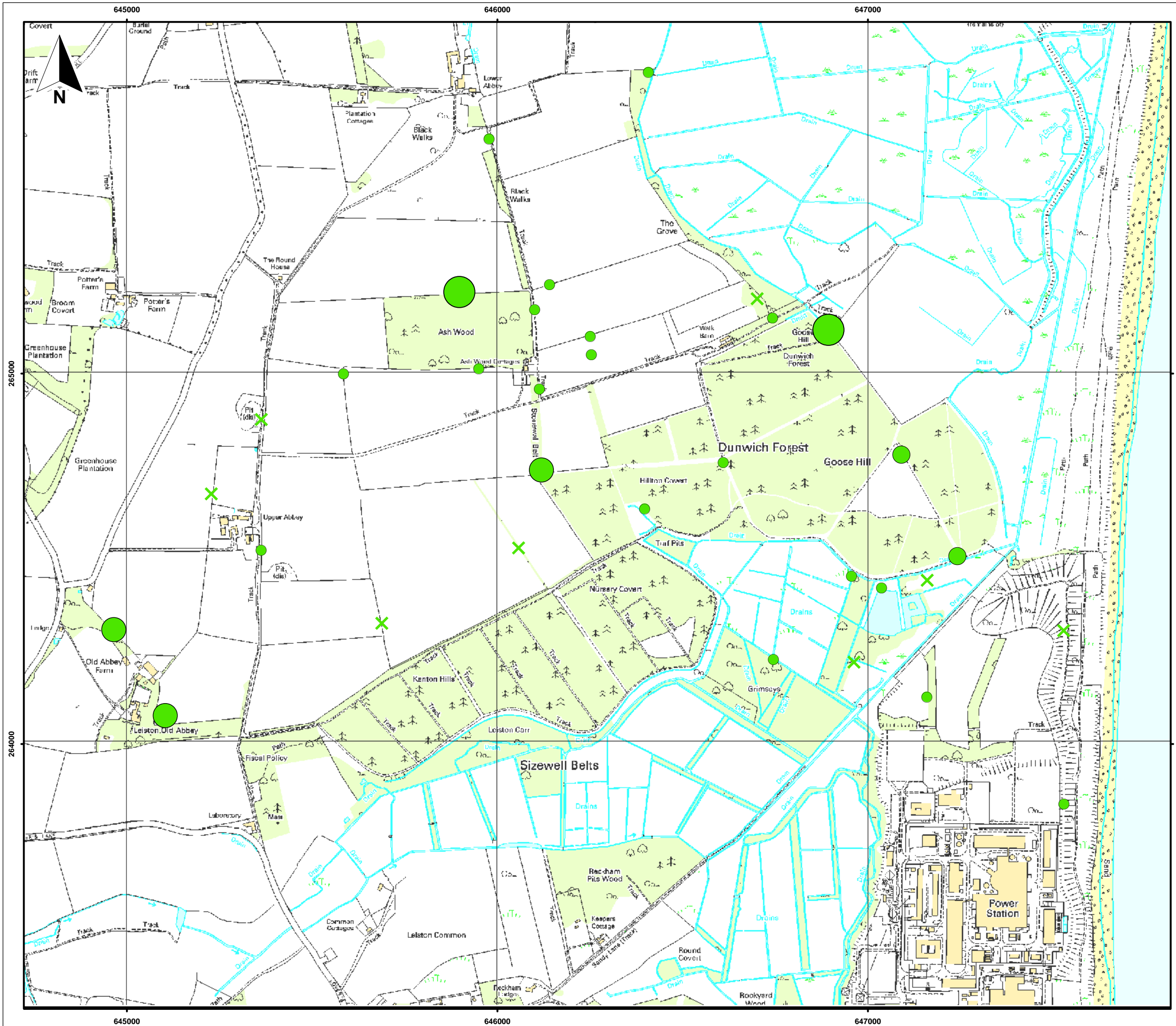


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Figure E7
Barbastelle commuting and foraging activity at static locations in summer and autumn (P2 and P3)

January 2011
28130-A299.mxd tugwc





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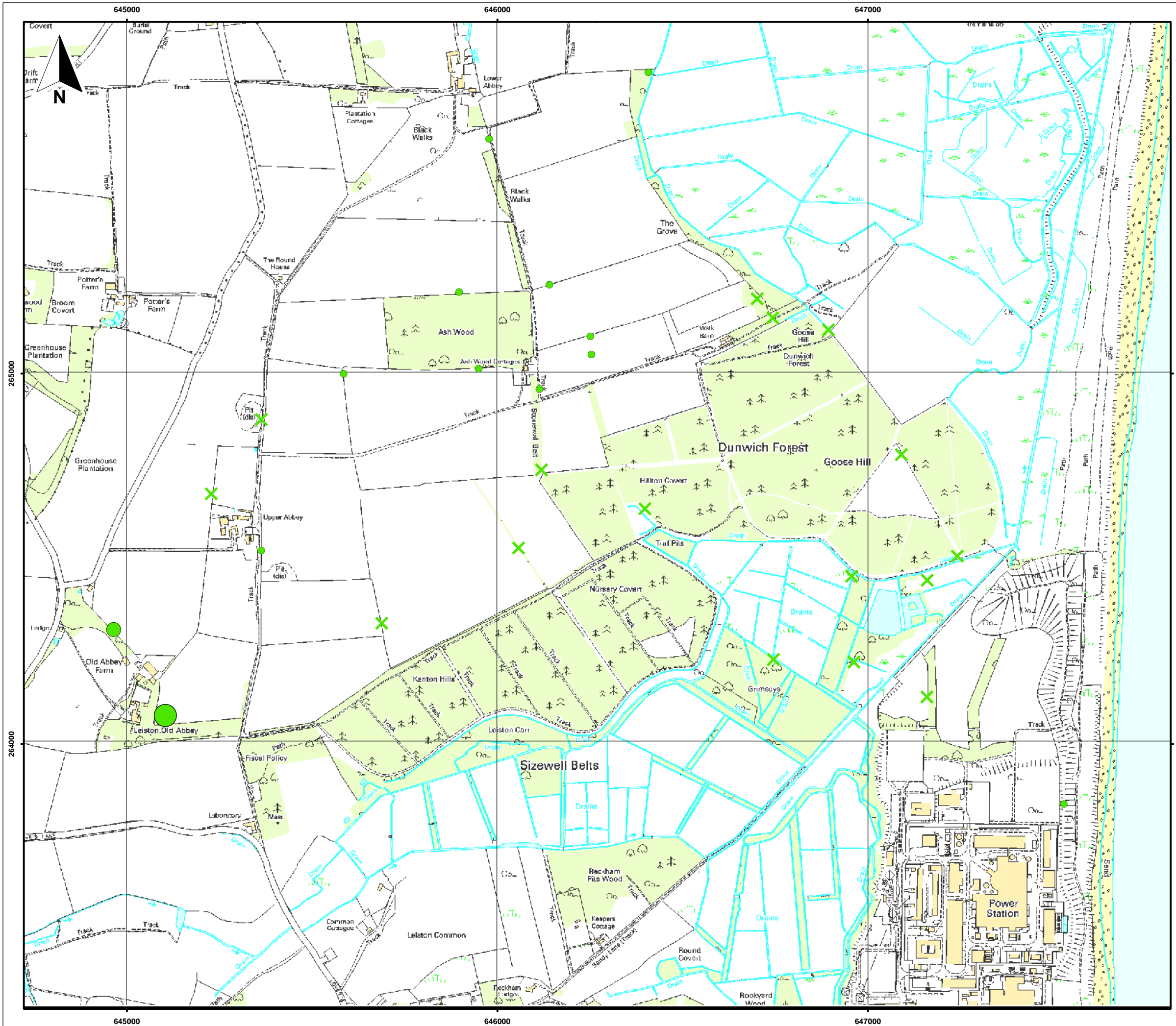
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Figure E8
Relative activity (B/h) of Leisler's bat at static locations in 2011

January 2011
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- Key:**
- ✕ No bats recorded
 - 0.01 - 0.25
 - 0.26 - 0.50
 - 0.51 - 1.20

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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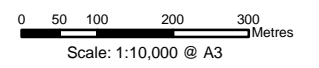
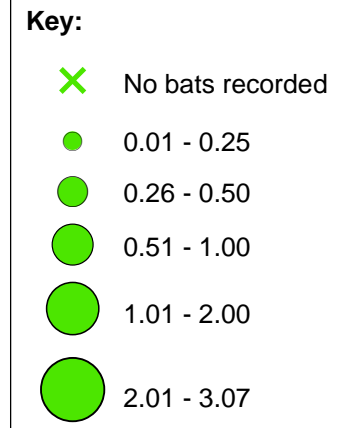
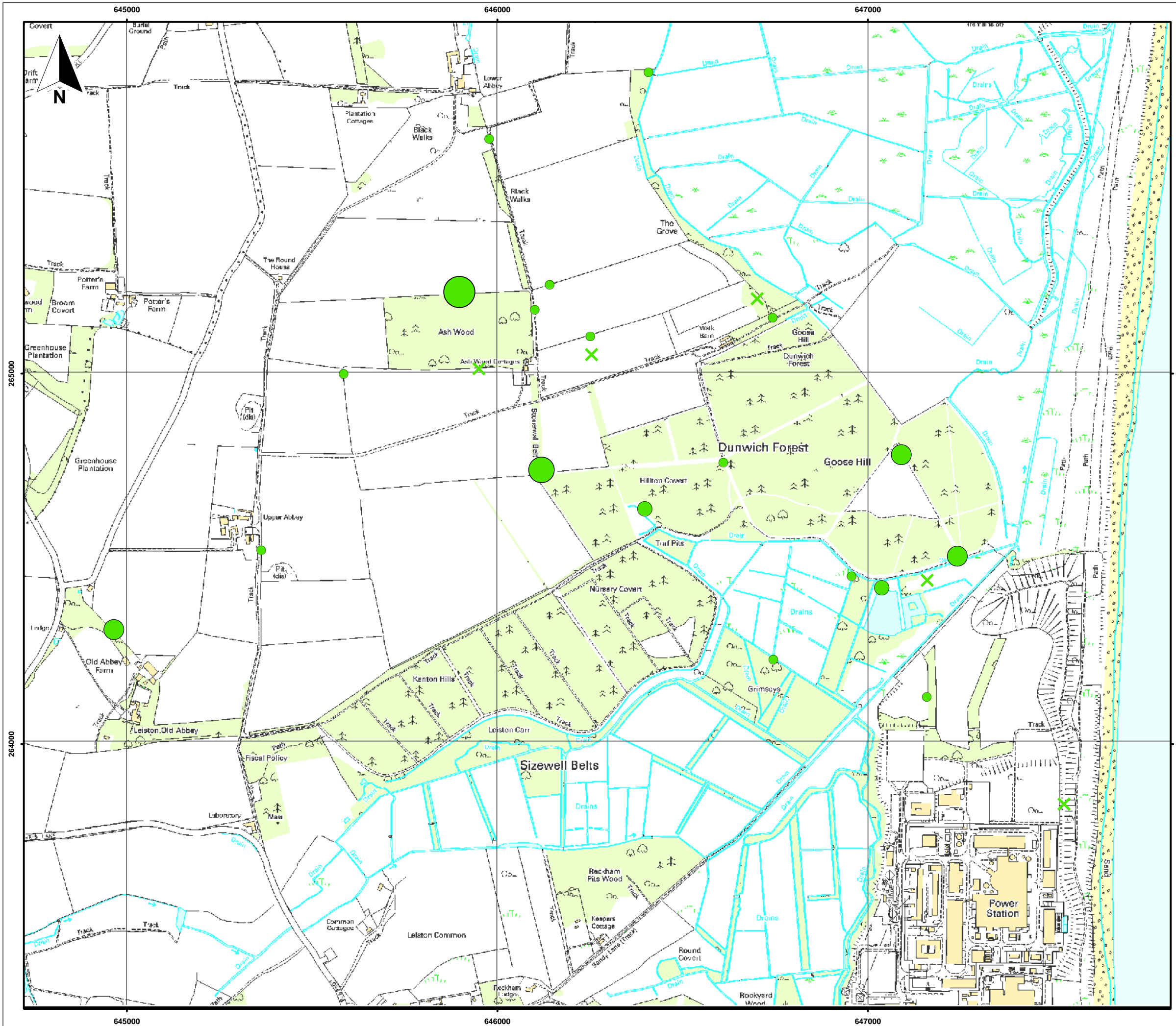
Sizerwell Bat Report 2011

Figure E9
Relative activity (B/h) of Leisler's bat at static locations - spring (P1)

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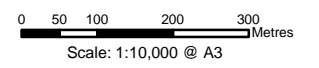
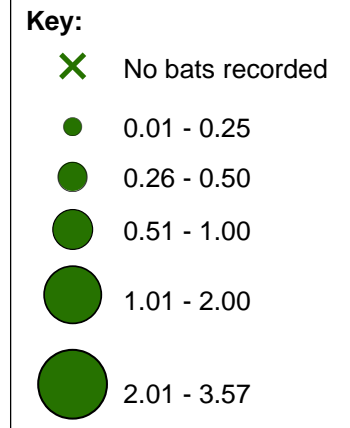
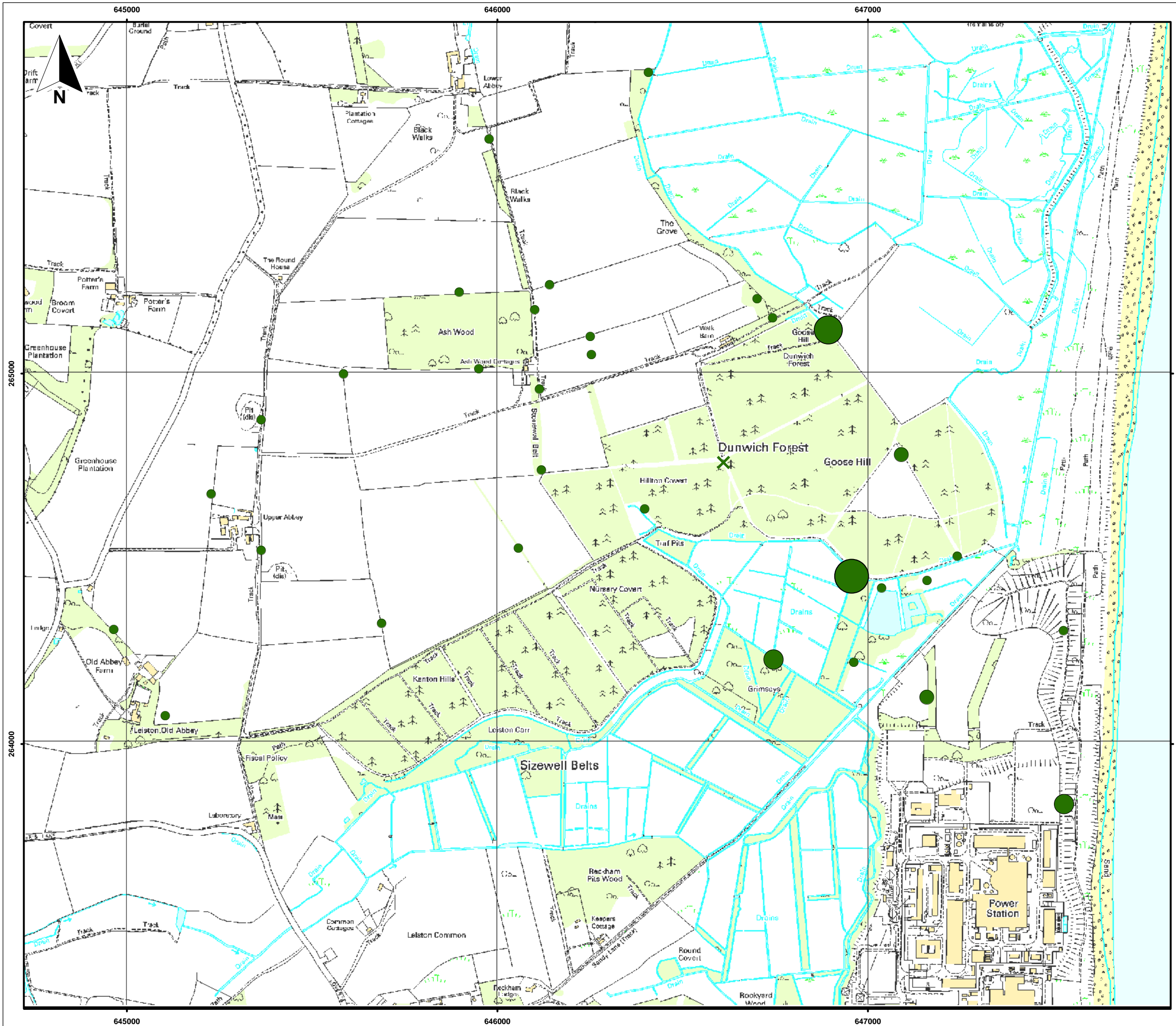
Sizewell Bat Report 2011

Figure E10
Relative activity (B/h) of Leisler's bat at static locations - summer (P2)

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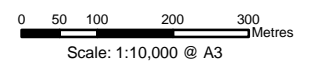
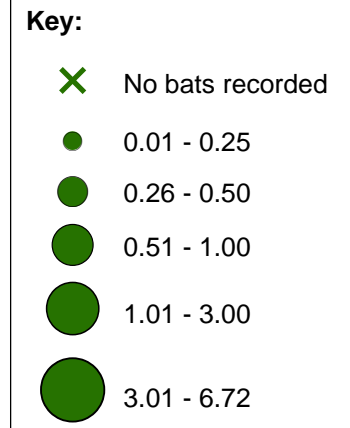
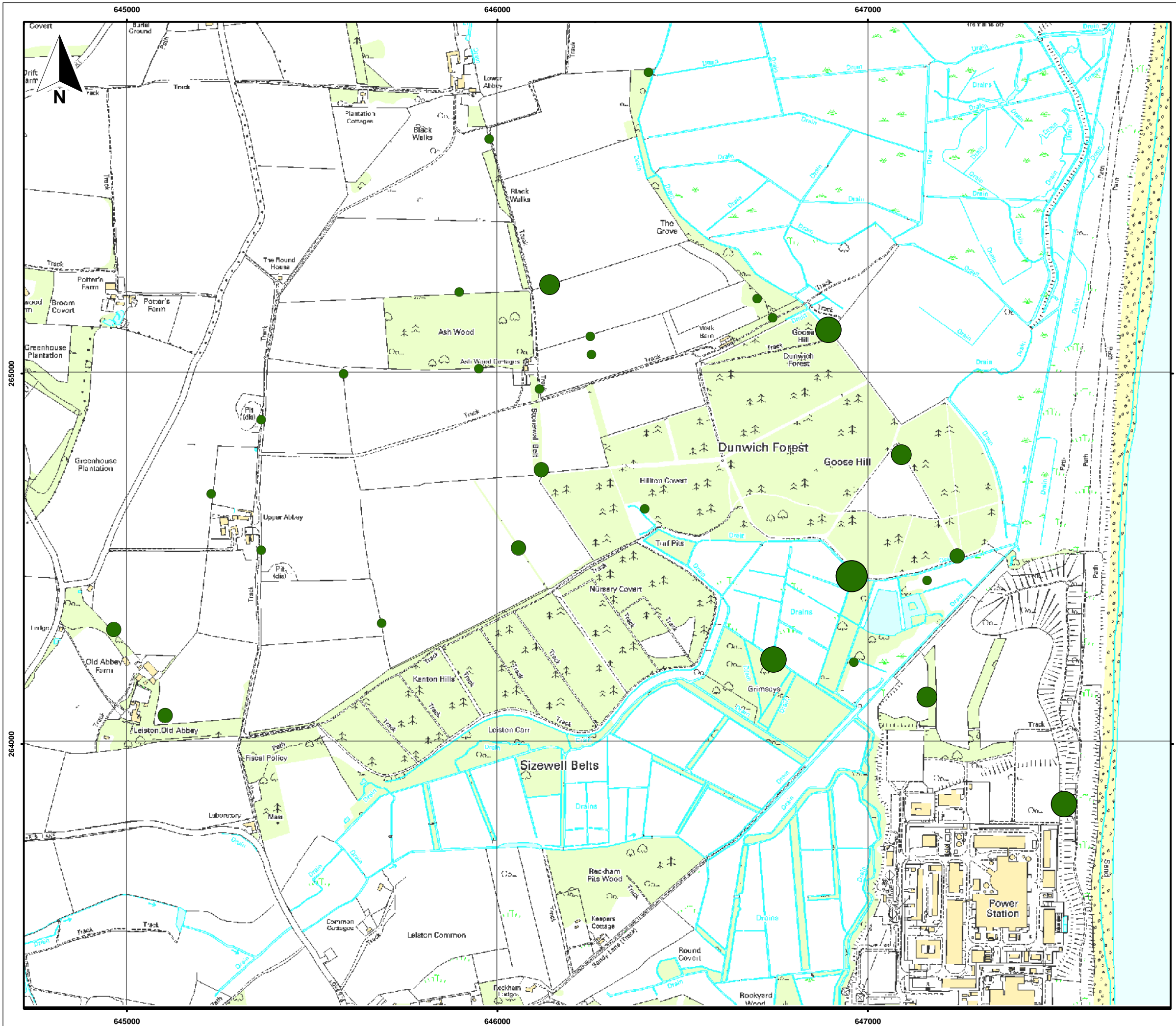
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Figure E11
Relative activity (B/h) of *Nathusius pipistrelle* at static locations in 2011

January 2011
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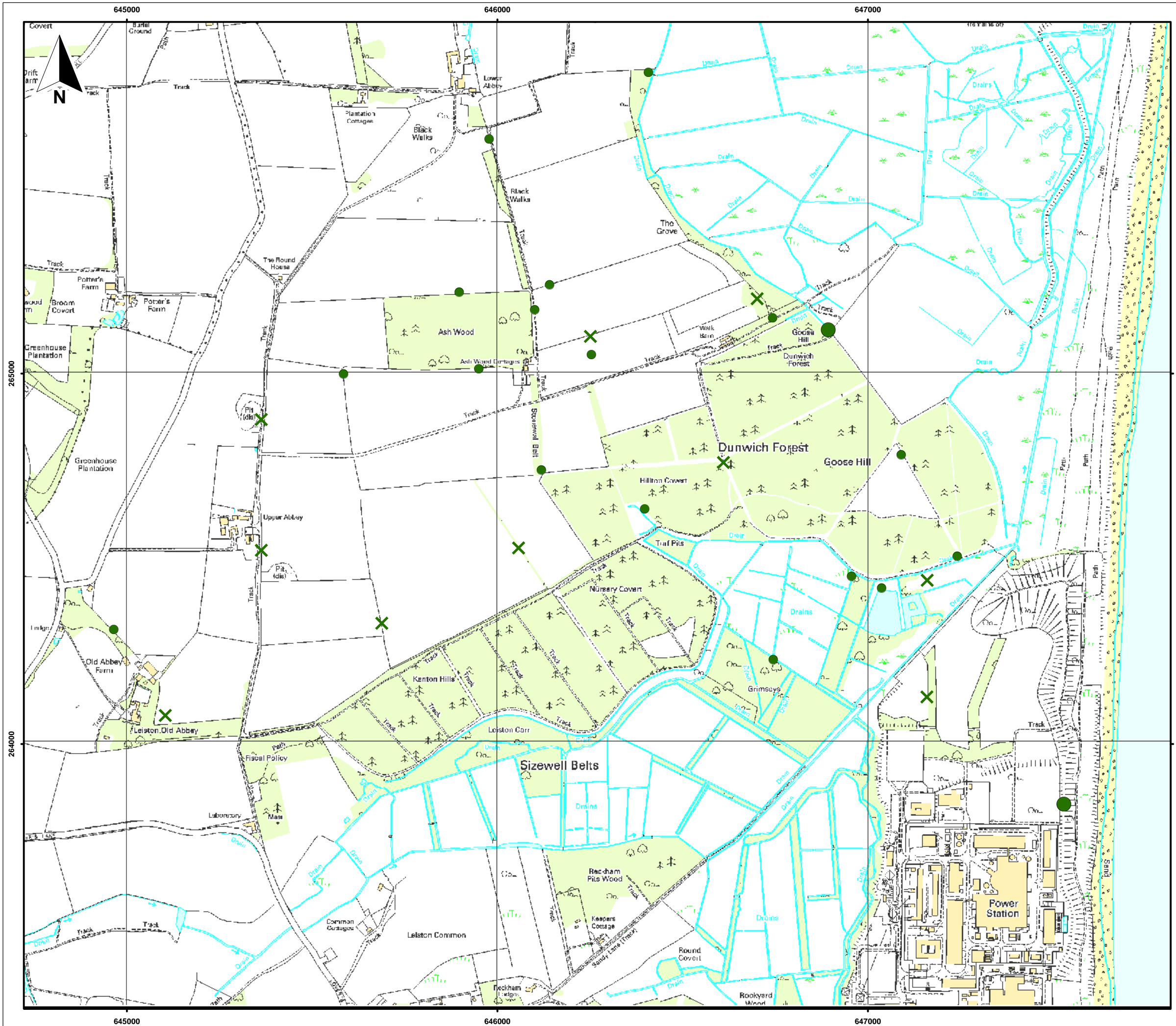
Sizewell Bat Report 2011

Figure E12
Relative activity (B/h) of Nathusius' pipistrelle at static locations - spring (P1)

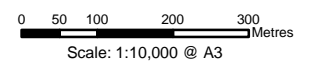
January 2011
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- Key:**
- ✕ No bats recorded
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 - 0.11 - 0.16



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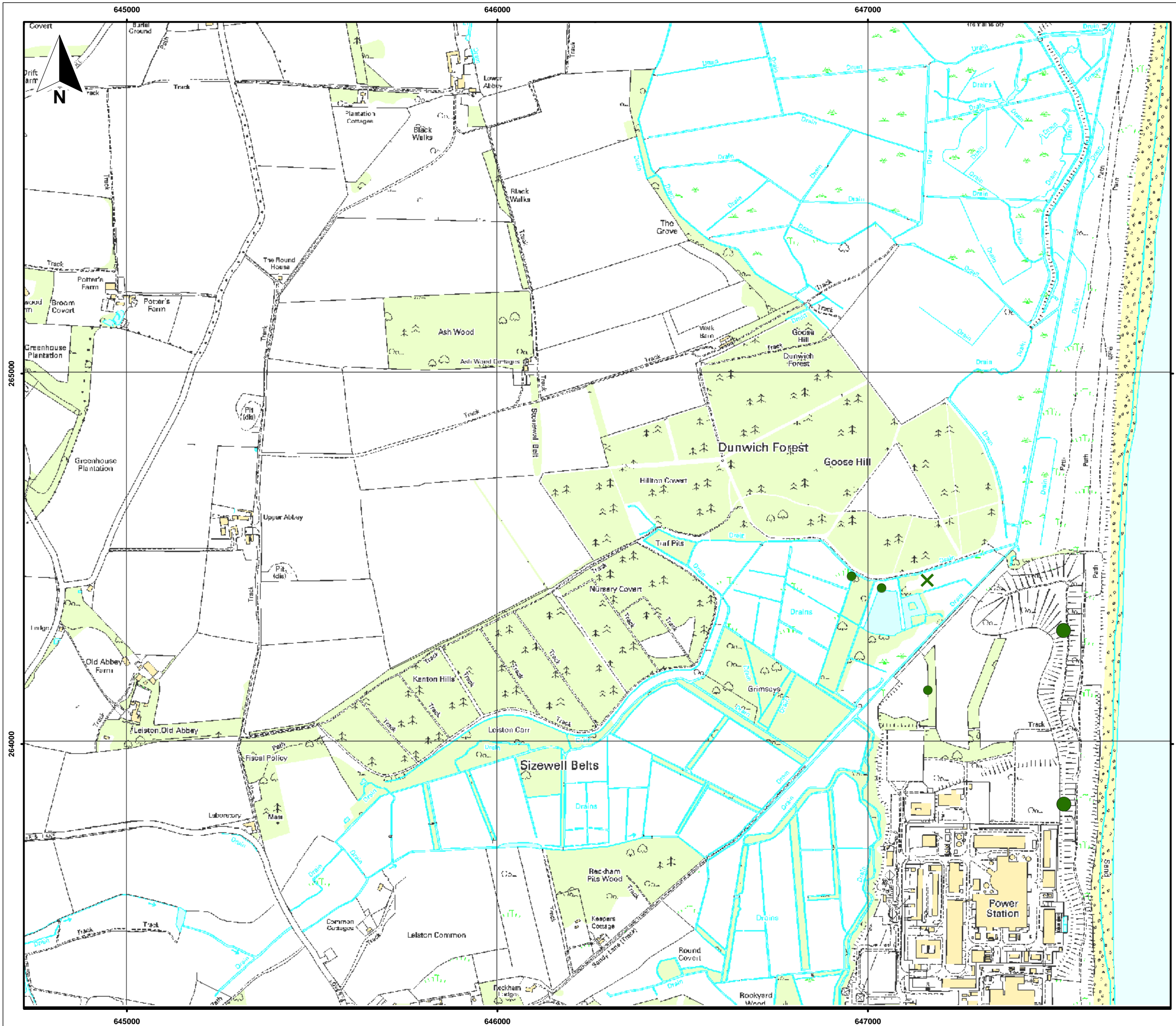
Sizerwell Bat Report 2011

Figure E13
Relative activity (B/h) of *Nathusius' pipistrelle* at static locations - summer (P2)

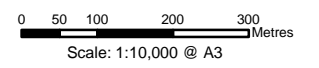
January 2011
28130-A305.mxd tugwc



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- Key:**
- X No bats recorded
 - 0.01 - 0.07
 - 0.08 - 0.14



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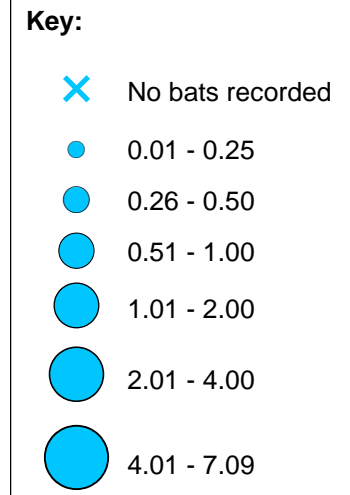
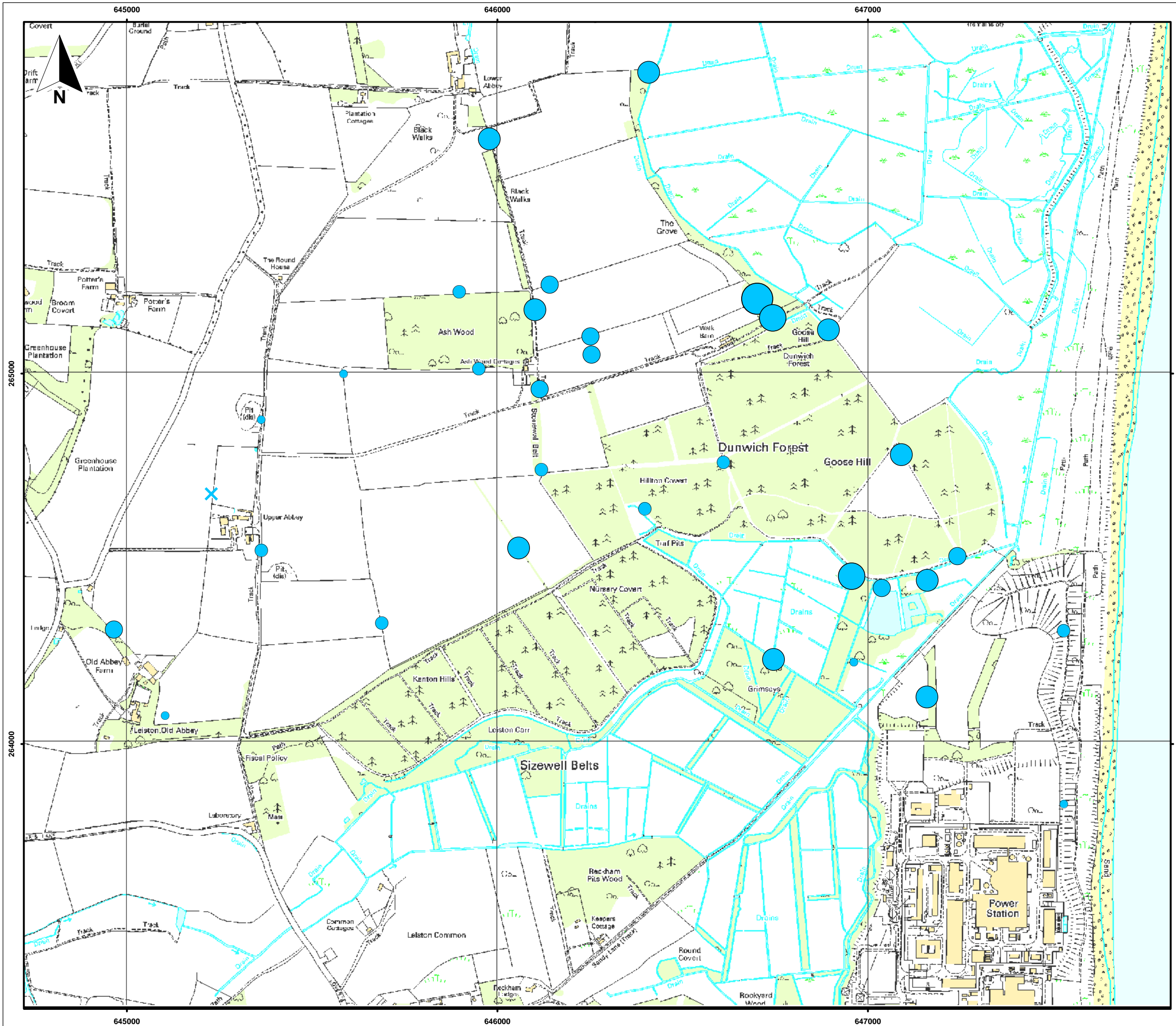
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Figure E14
Relative activity (B/h) of Nathusius' pipistrelle at static locations - autumn (P3)

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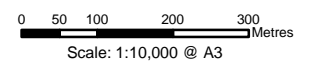
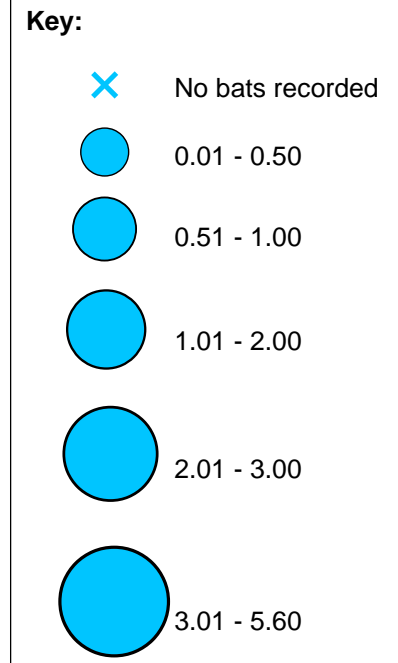
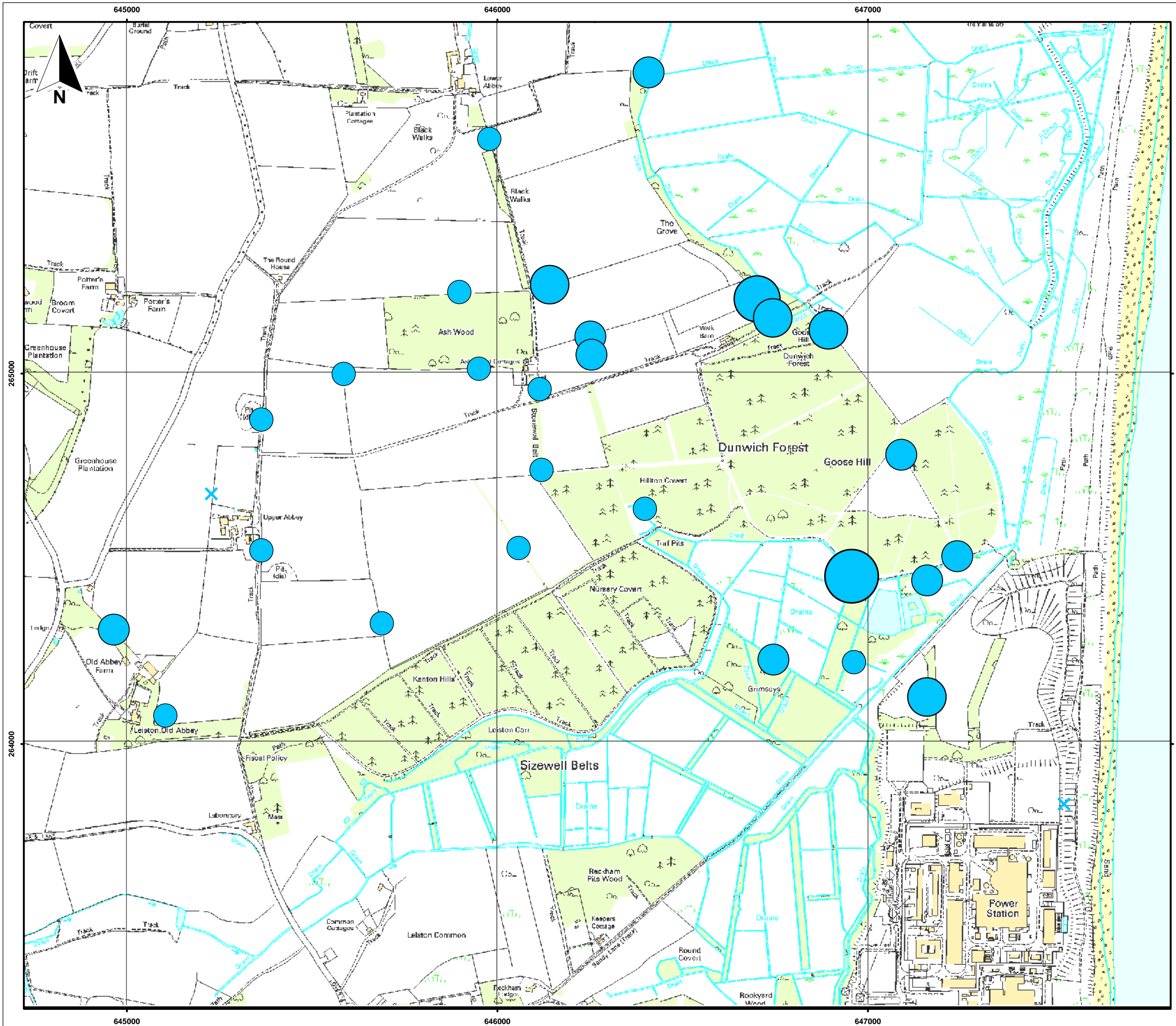
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Figure E15
Relative activity (B/h) of *Myotis* sp. at static locations in 2011

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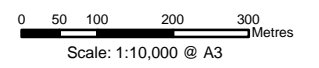
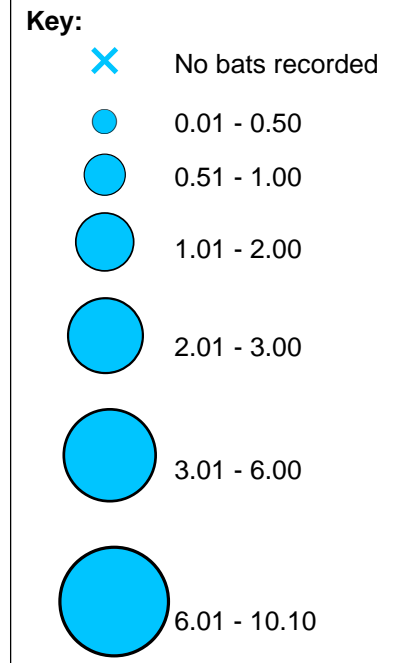
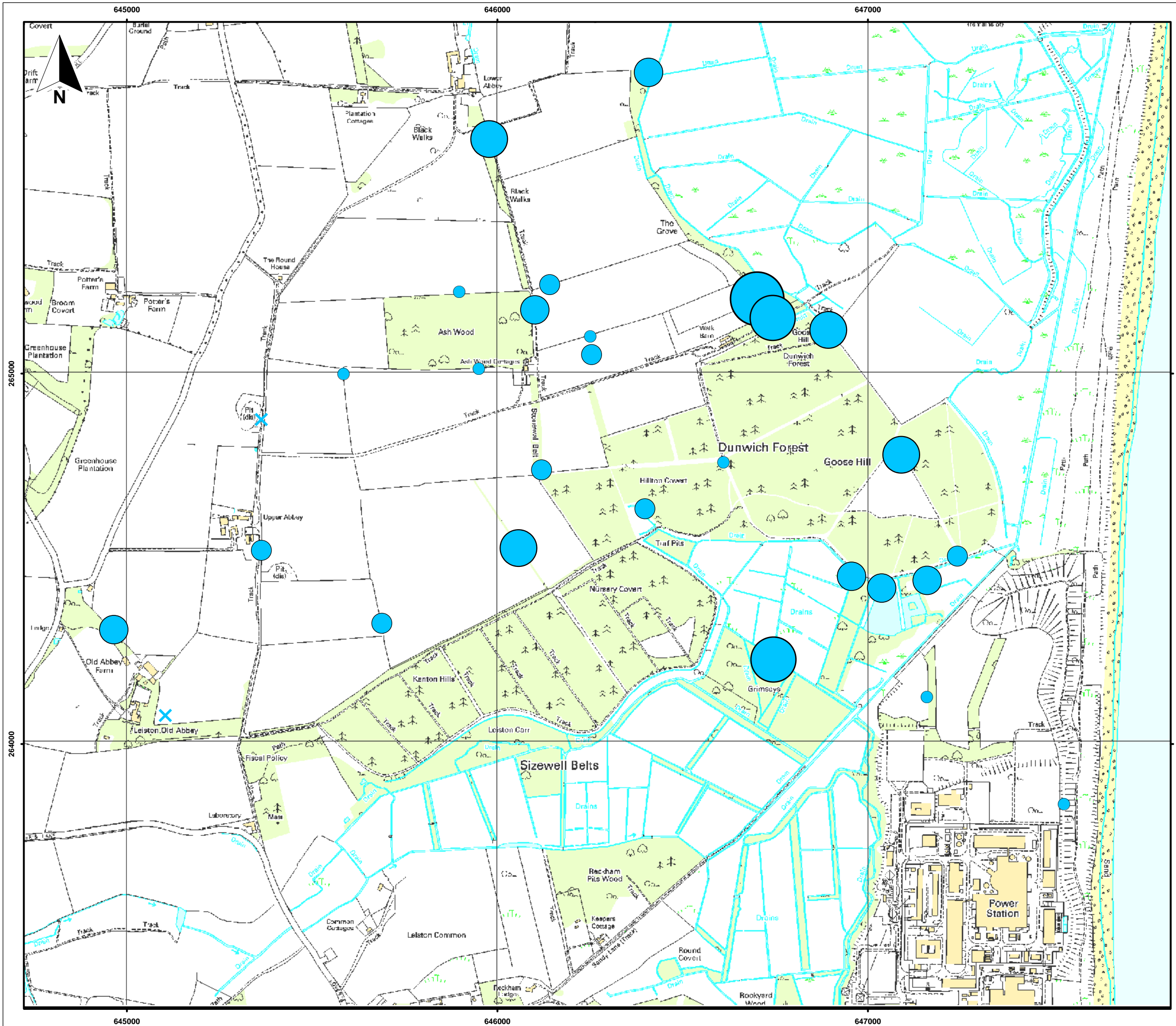
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Figure E16
Relative activity (B/h) of *Myotis* sp. at static locations - spring (P1)

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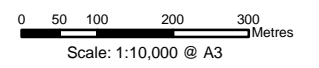
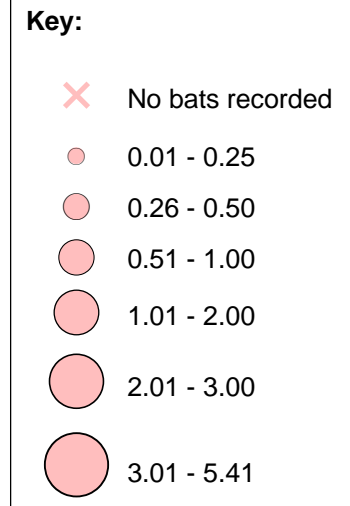
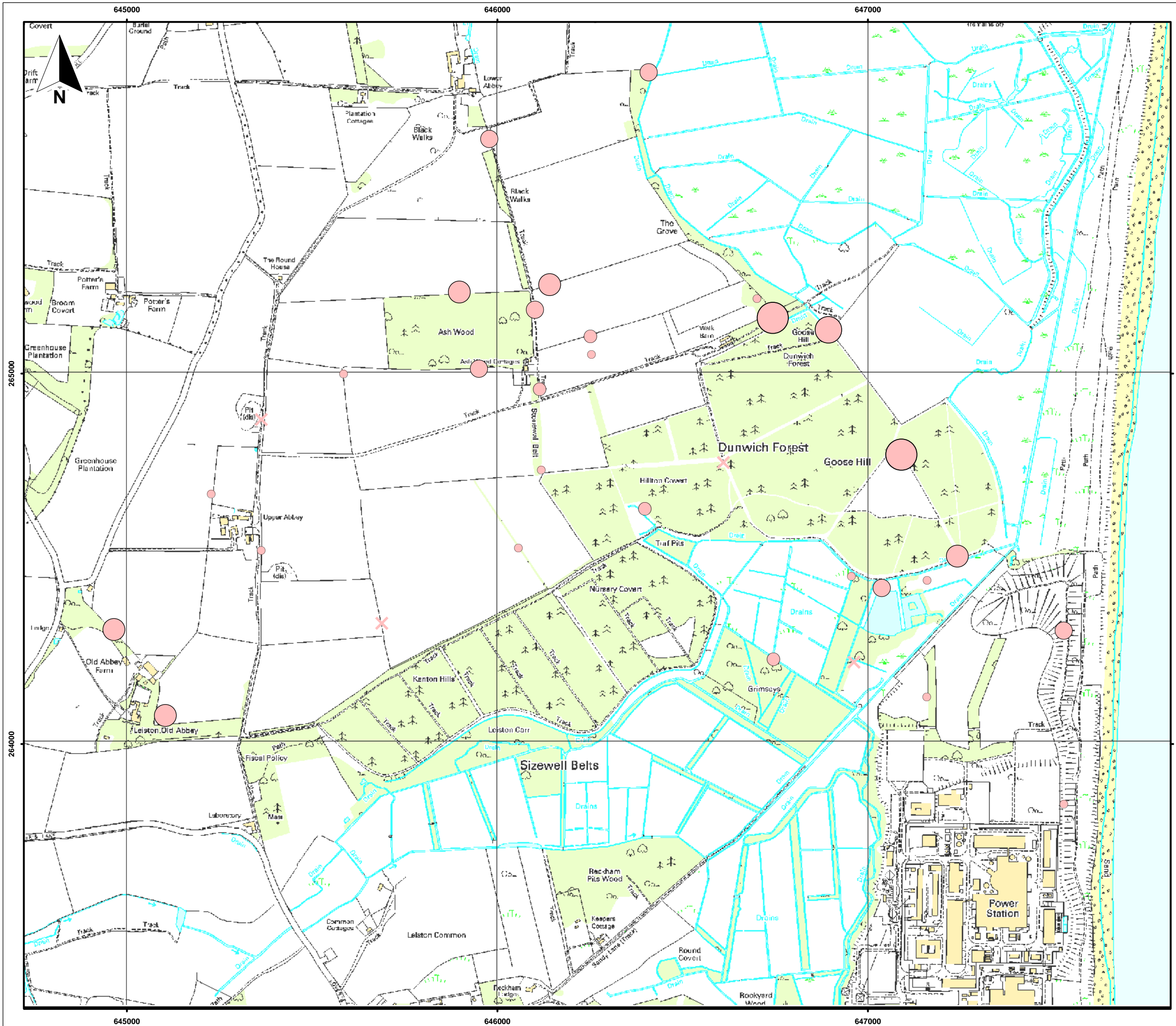
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Figure E17
Relative activity (B/h) of *Myotis* sp. at static locations - summer (P2)

January 2011
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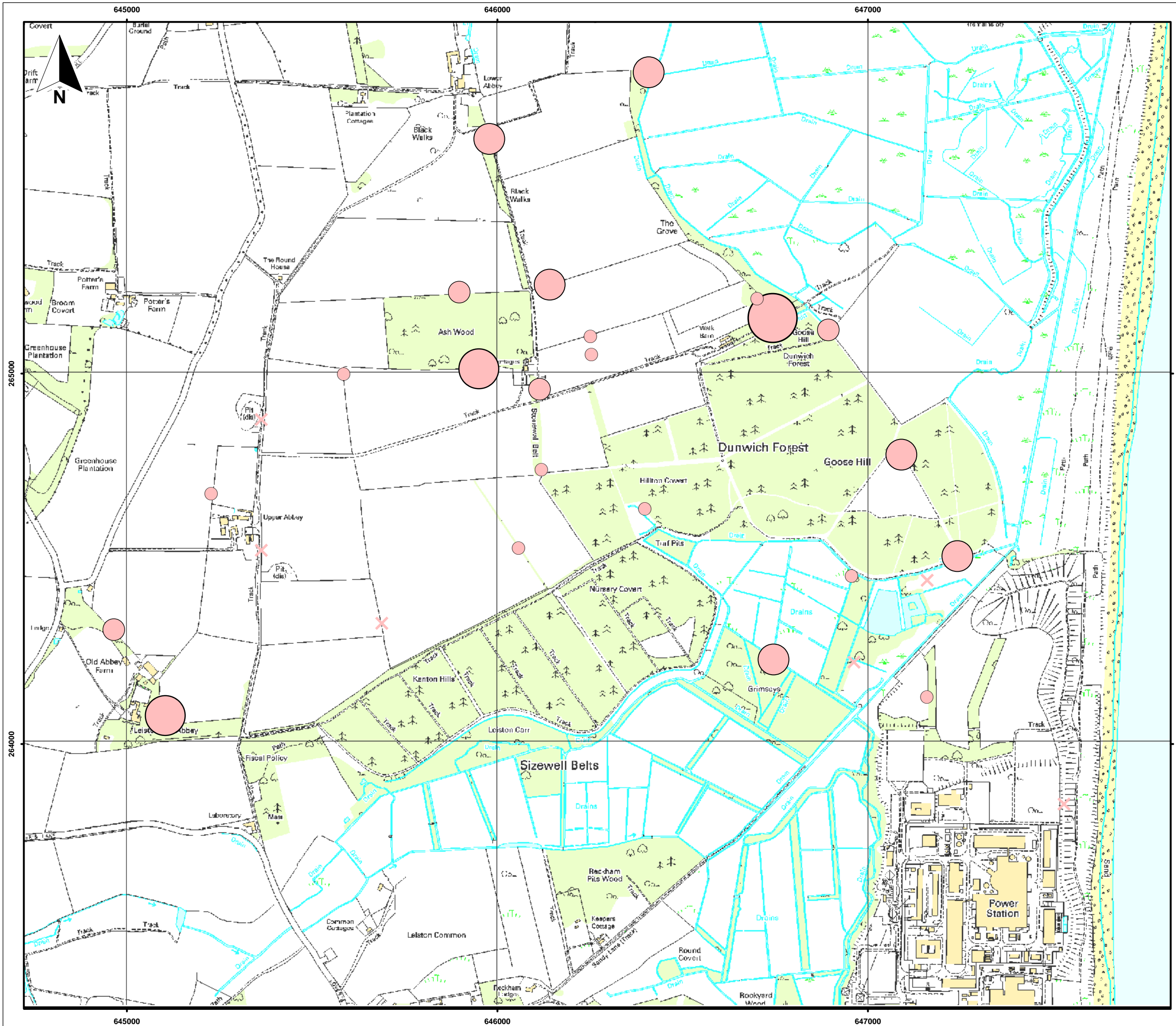
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Figure E18
Relative activity (B/h) of noctule at static locations in 2011

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- Key:**
- ✗ No bats recorded
 - 0.01 - 0.25
 - 0.26 - 0.50
 - 0.51 - 1.00
 - 1.01 - 3.00
 - 3.01 - 12.93

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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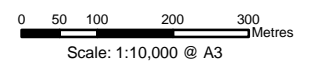
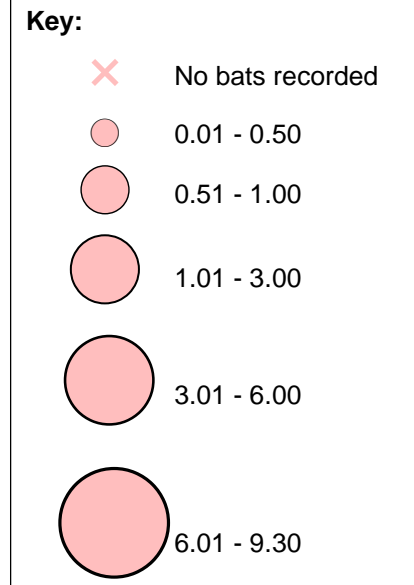
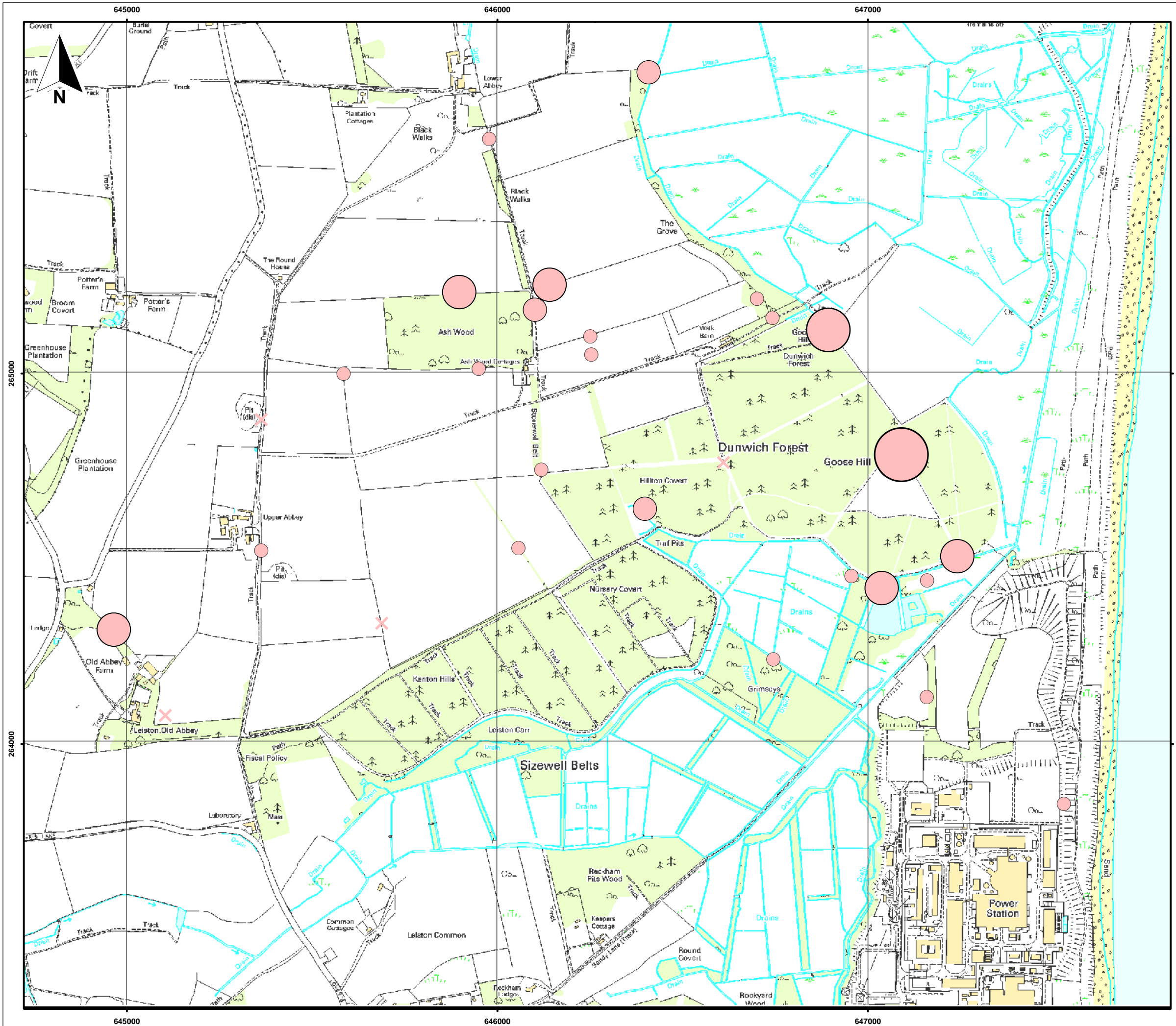
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Figure E19
Relative activity (B/h) of noctule at static locations - spring (P1)

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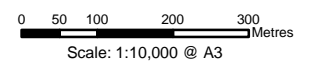
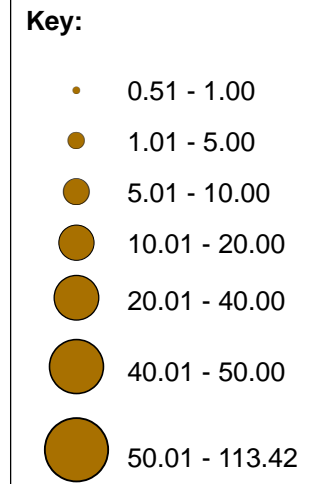
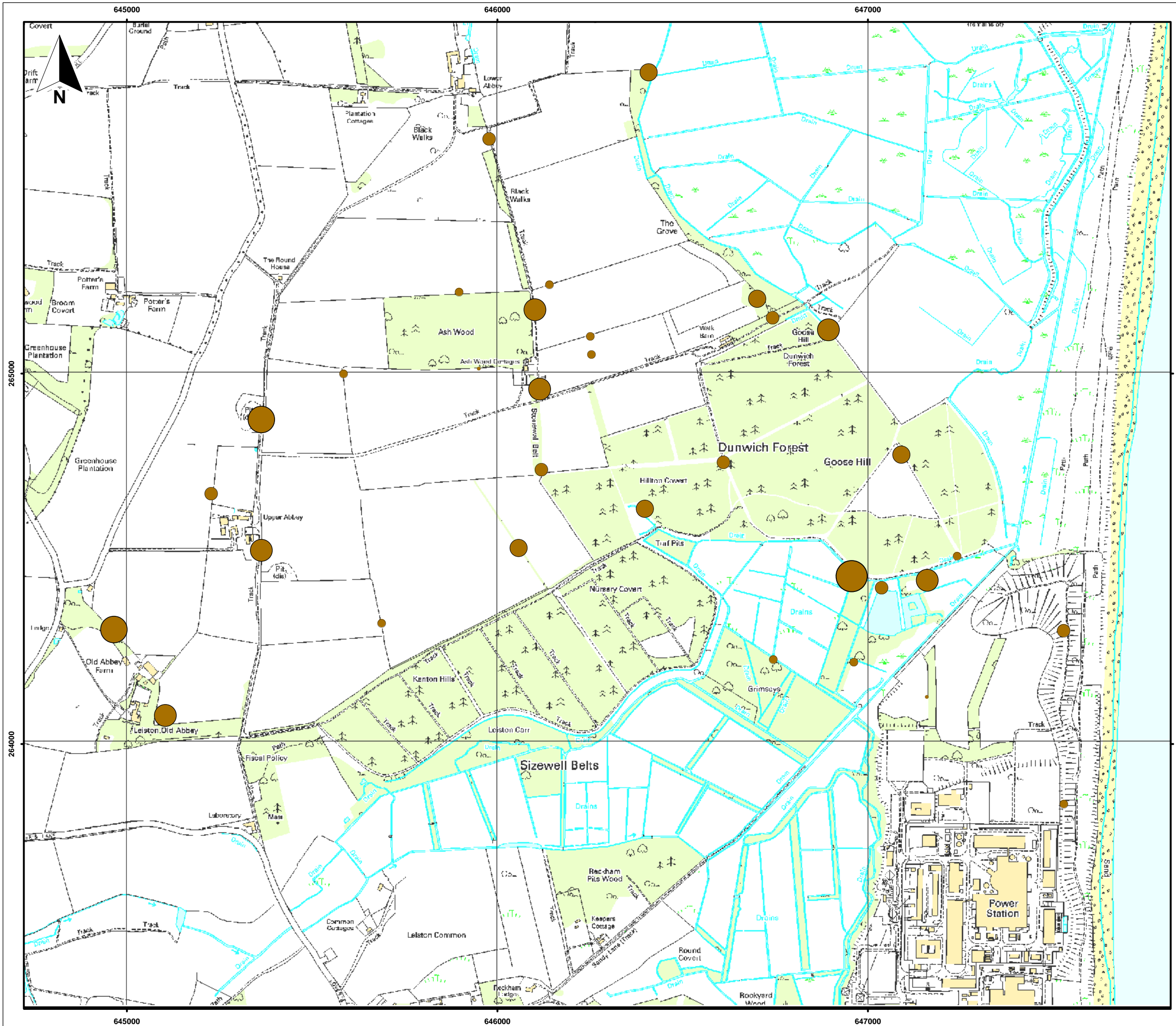
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Figure E20
Relative activity (B/h) of noctule at static locations - summer (P2)

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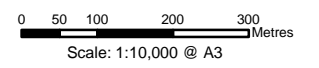
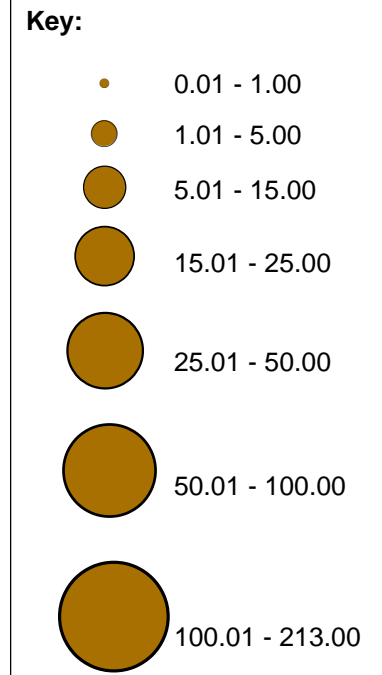
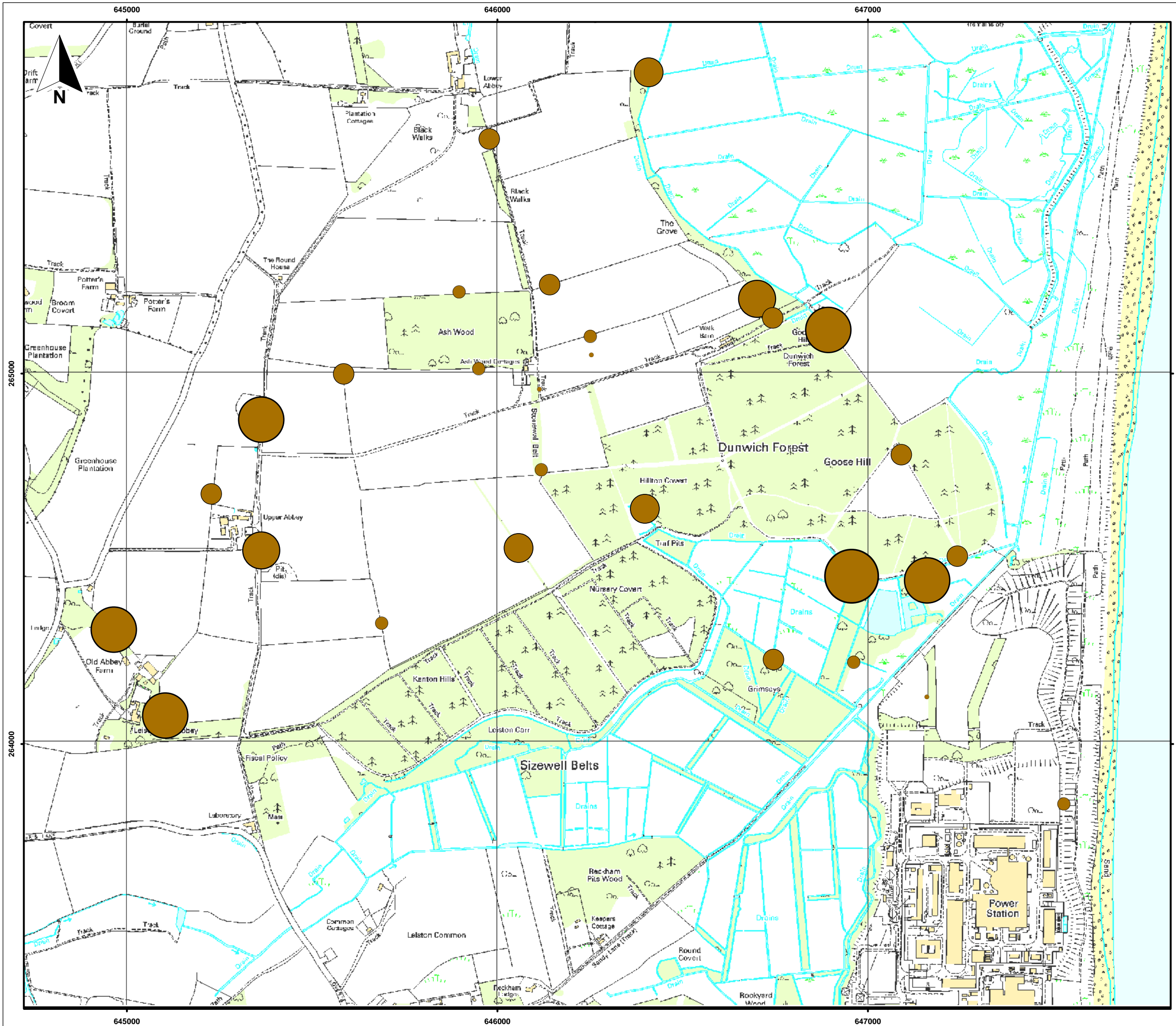
Sizewell Bat Report 2011

Figure E21
Relative activity (B/h) of common pipistrelle at static locations in 2011

January 2011
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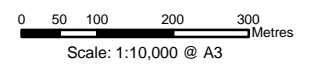
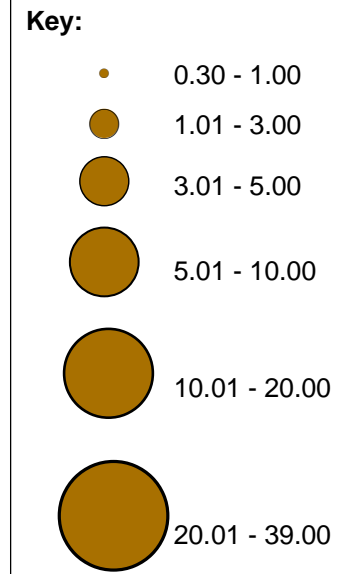
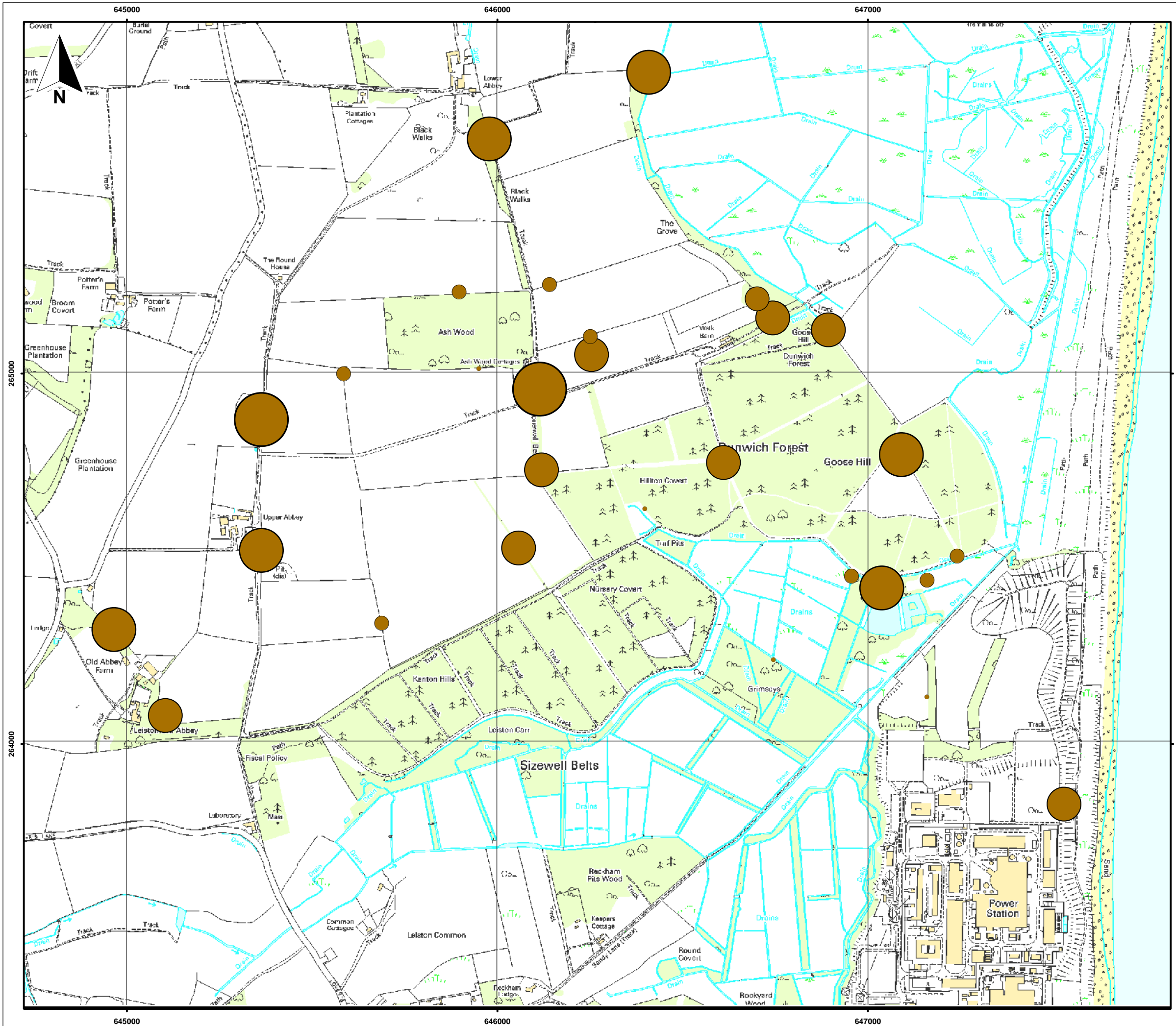
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Figure E22
Relative activity (B/h) of common pipistrelle at static locations - spring (P1)

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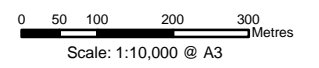
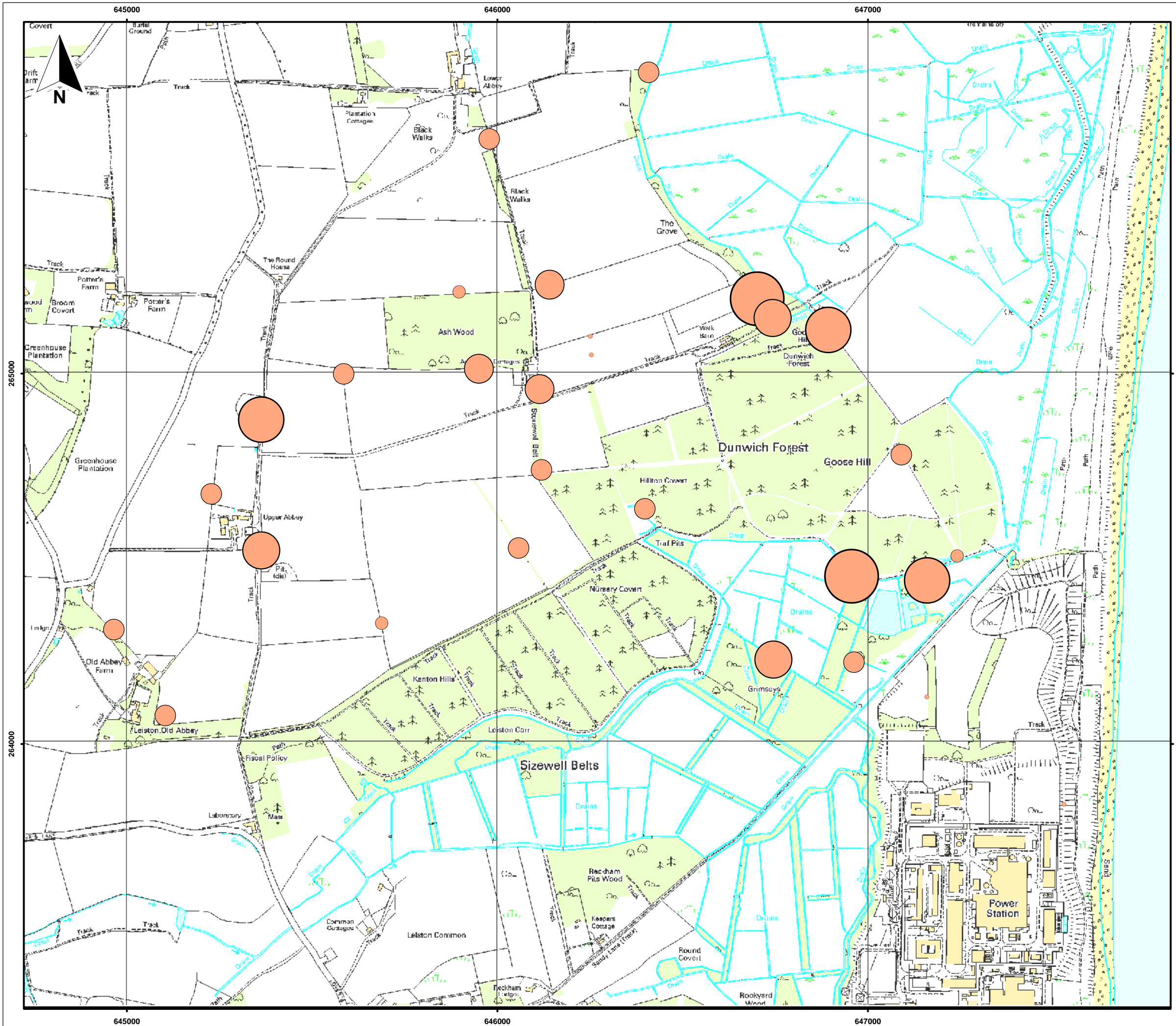
Sizewell Bat Report 2011

Figure E23
Relative activity (B/h) of common pipistrelle at static locations - summer (P2)

January 2011
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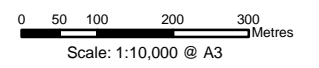
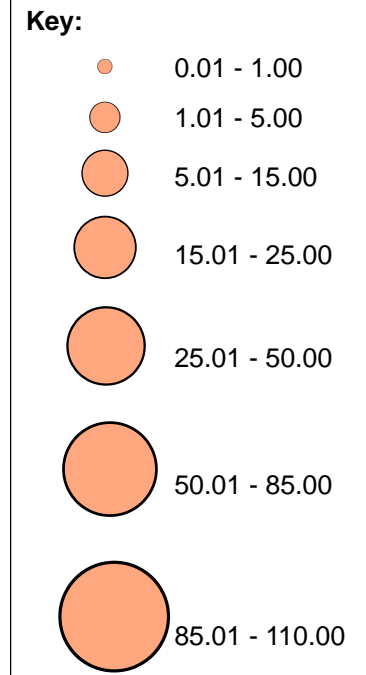
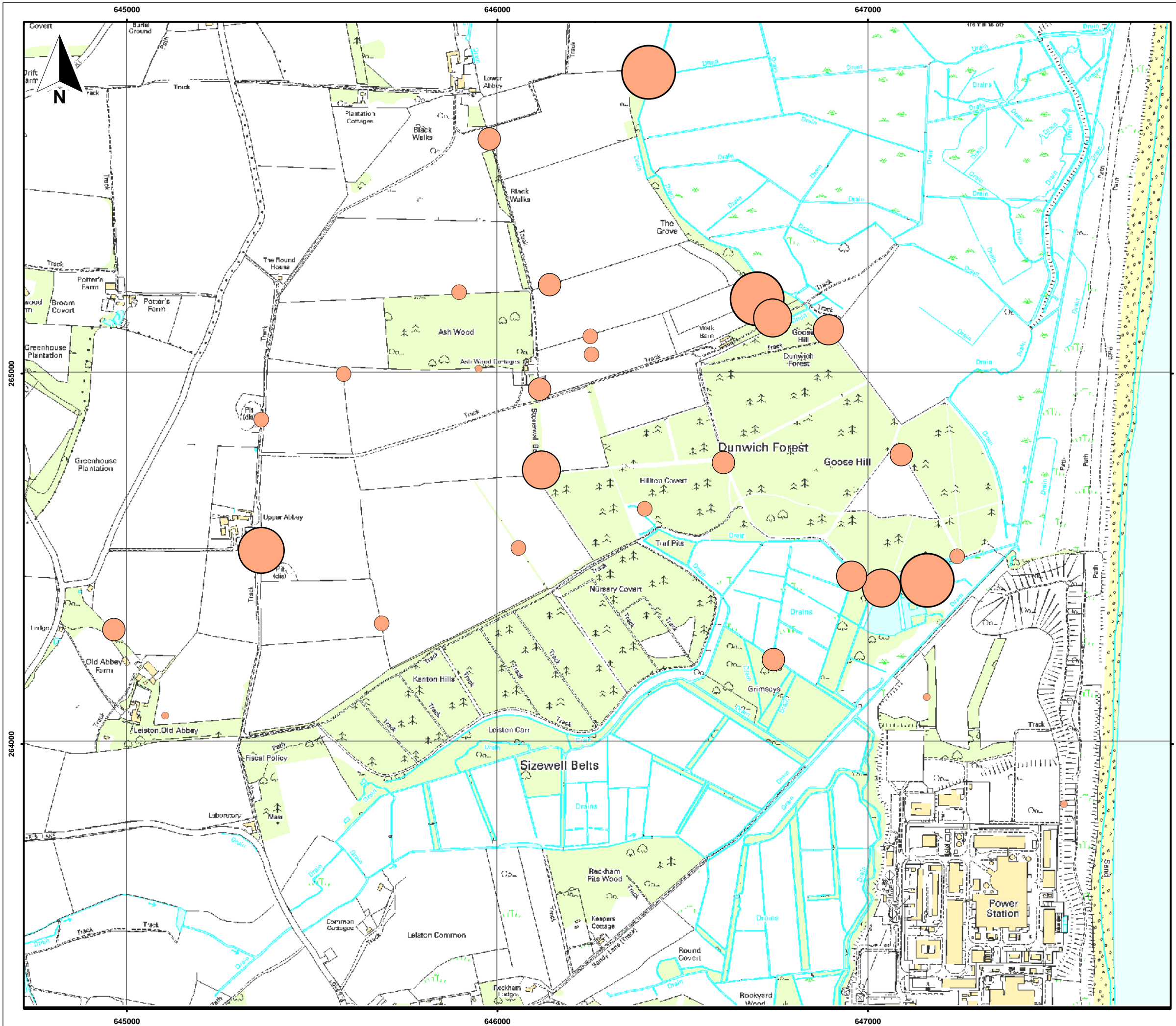
Sizewell Bat Report 2011

Figure E25
Relative activity (B/h) of soprano pipistrelle at static locations - spring (P1)

January 2011
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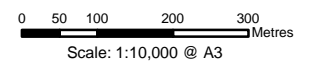
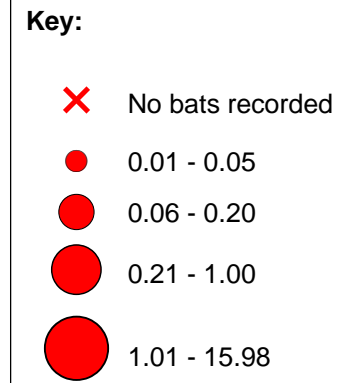
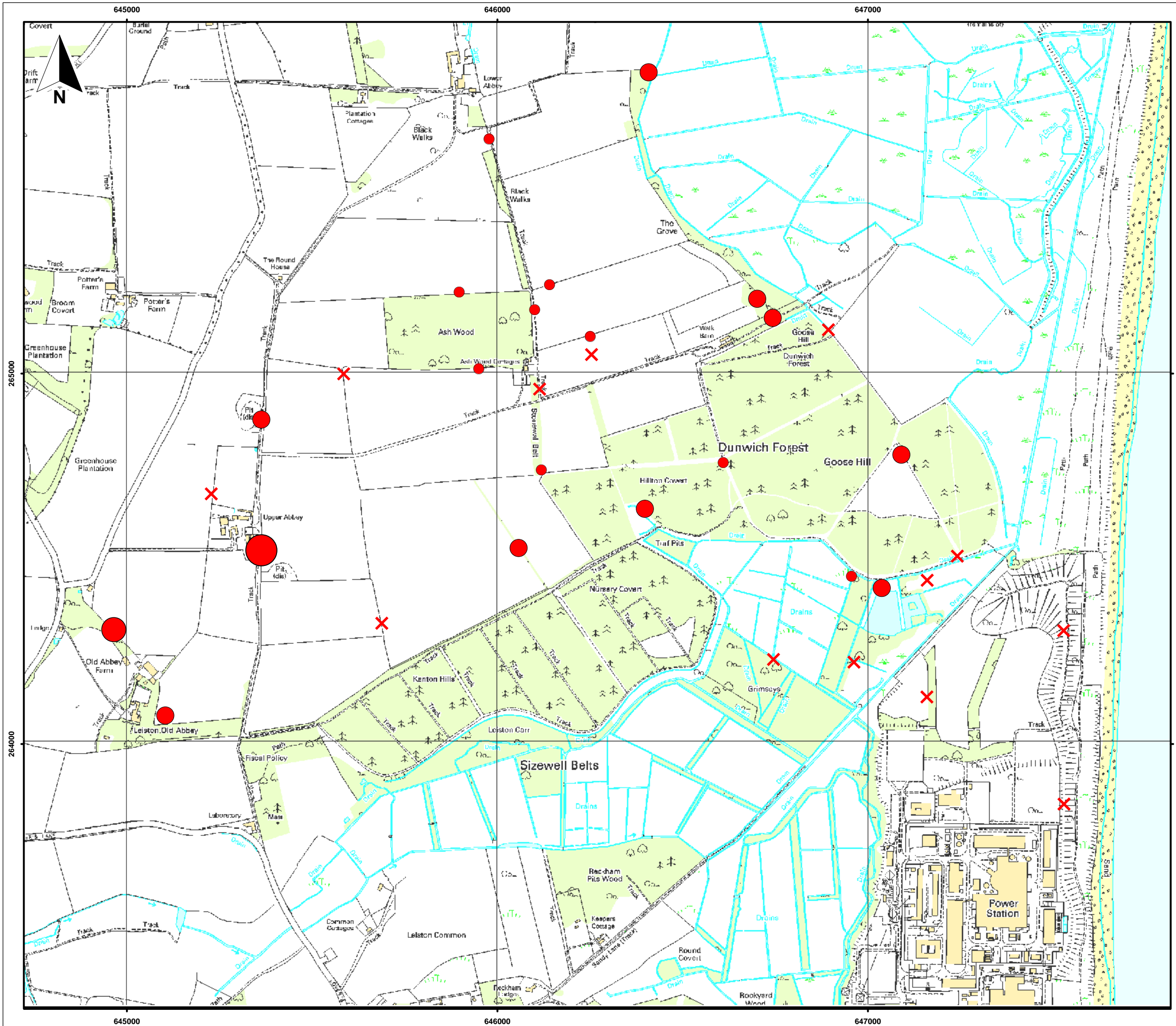
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Figure E26
Relative activity (B/h) of soprano pipistrelle at static locations - summer (P2)

January 2011
28130-A318.mxd tugwc



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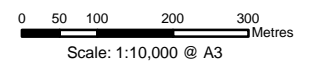
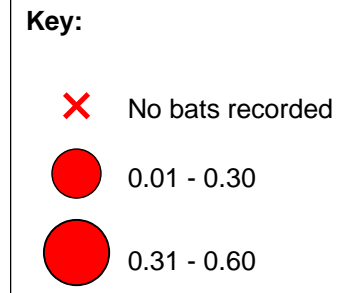
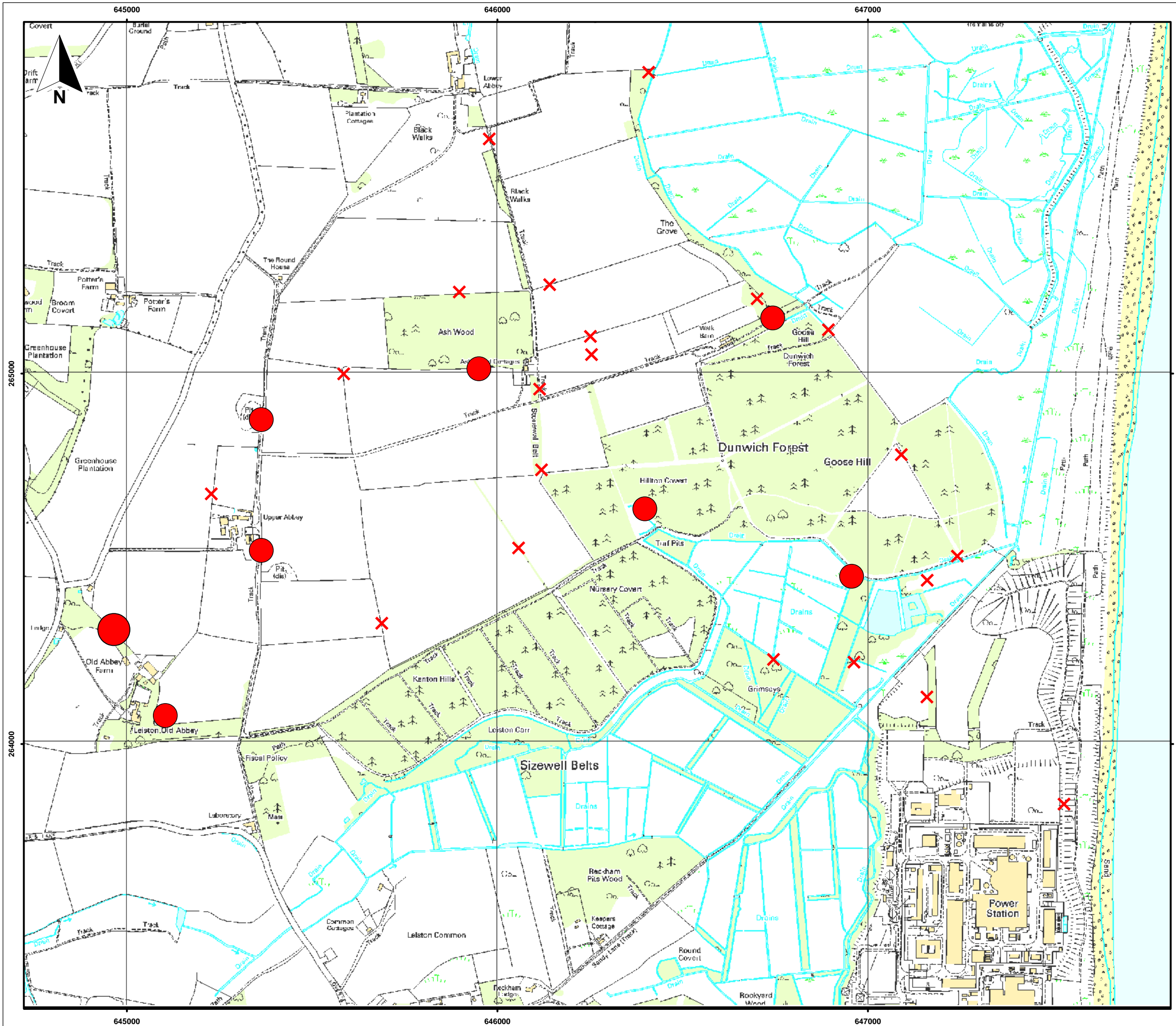
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Sizerwell Bat Report 2011

Figure E27
Relative activity (B/h) of serotine at static locations in 2011

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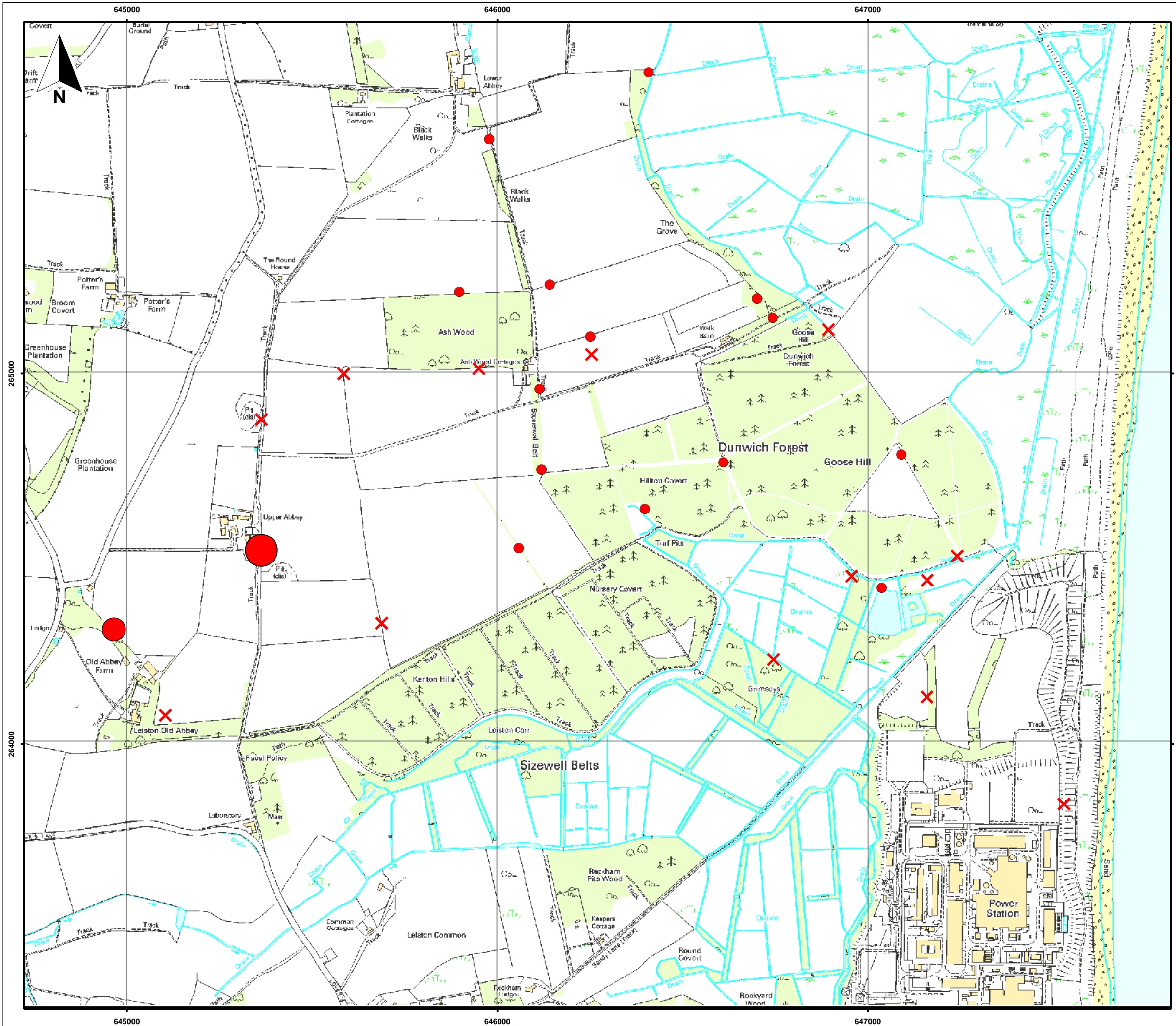
Sizewell Bat Report 2011

Figure E28
Relative activity (B/h) of serotine at static locations - spring (P1)

January 2011
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- Key:**
- ✗ No bats recorded
 - 0.01 - 0.50
 - 0.51 - 1.00
 - 1.01 - 30.90

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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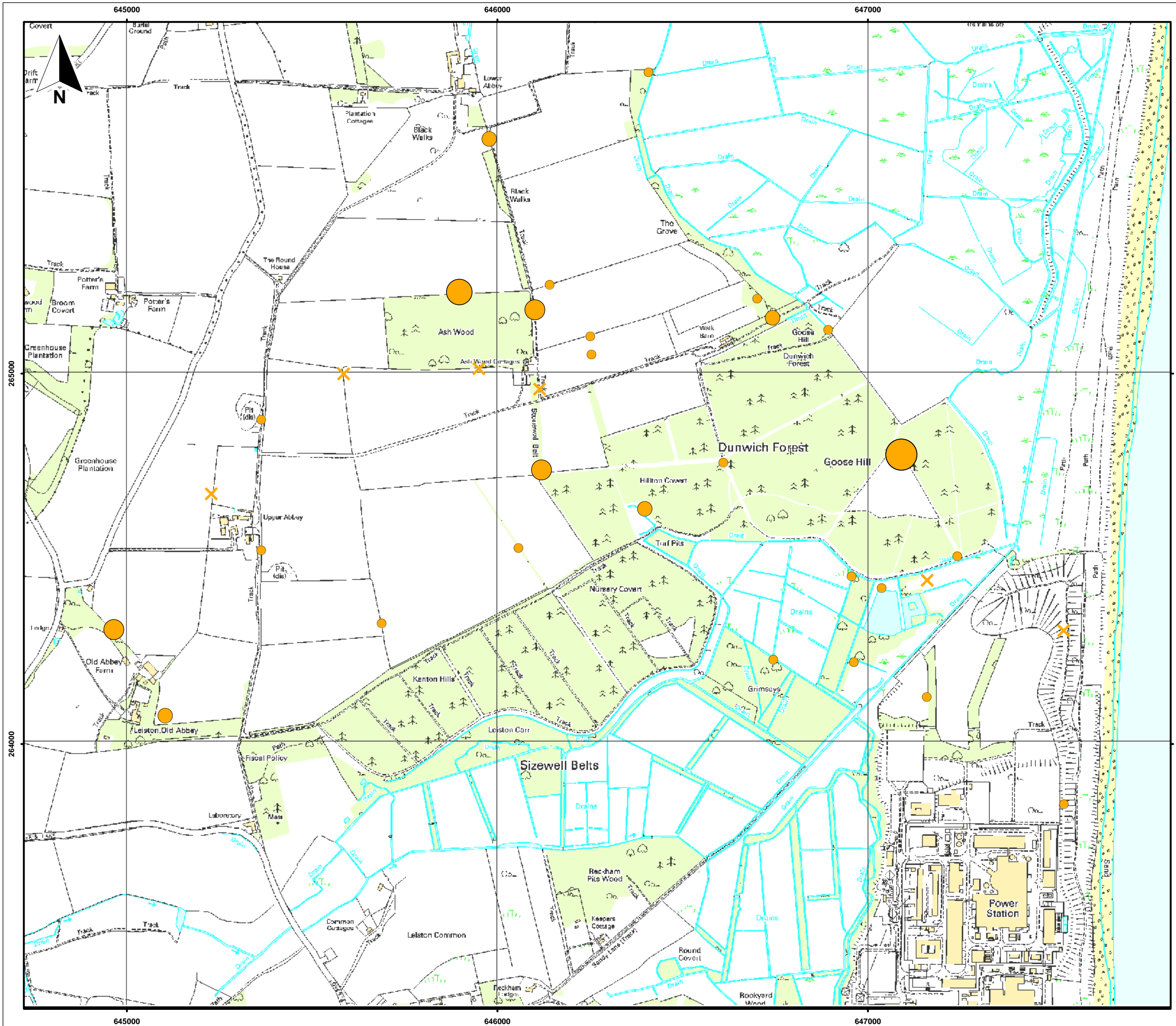
Sizewell Bat Report 2011

Figure E29
Relative activity (B/h) of serotine at static locations - summer (P2)

January 2011
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 Scale: 1:10,000 @ A3
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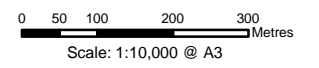
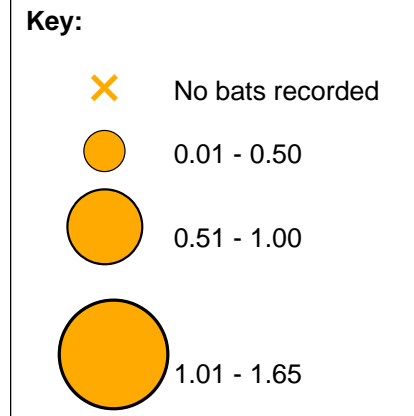
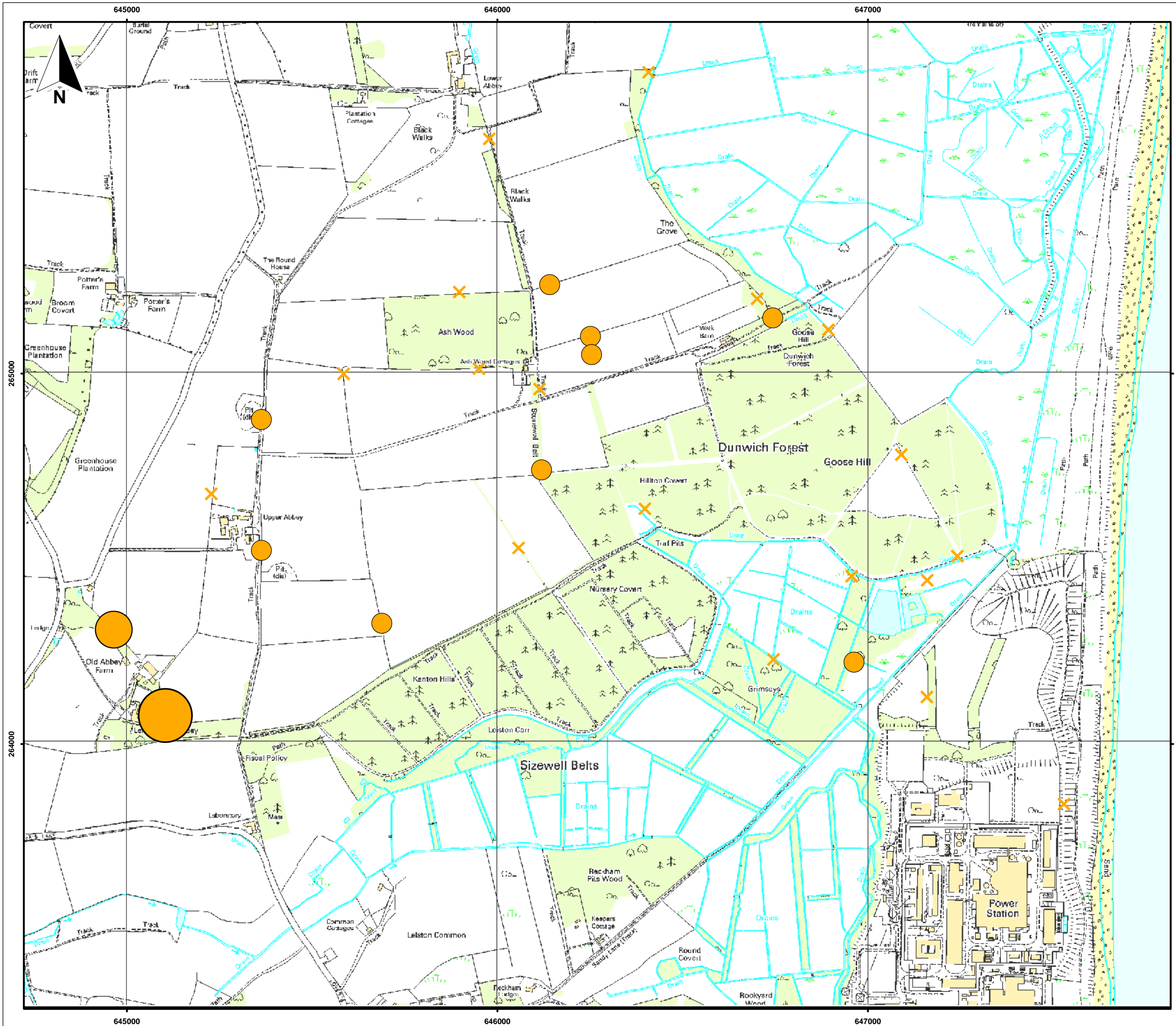
Sizerwell Bat Report 2011

Figure E30
 Relative activity (B/h) of serotine/Leisler's bat at static locations in 2011

January 2011
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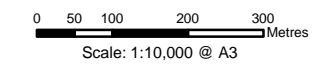
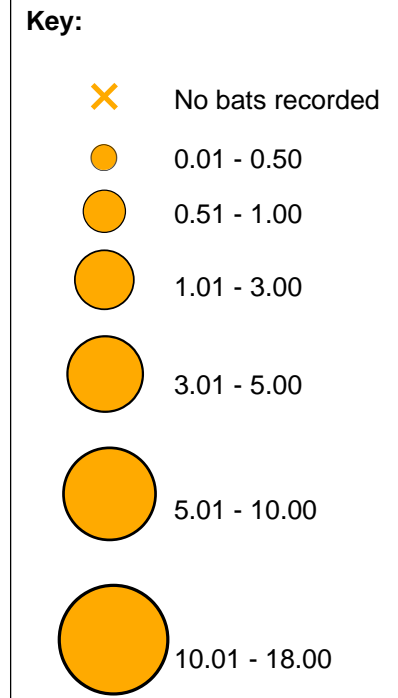
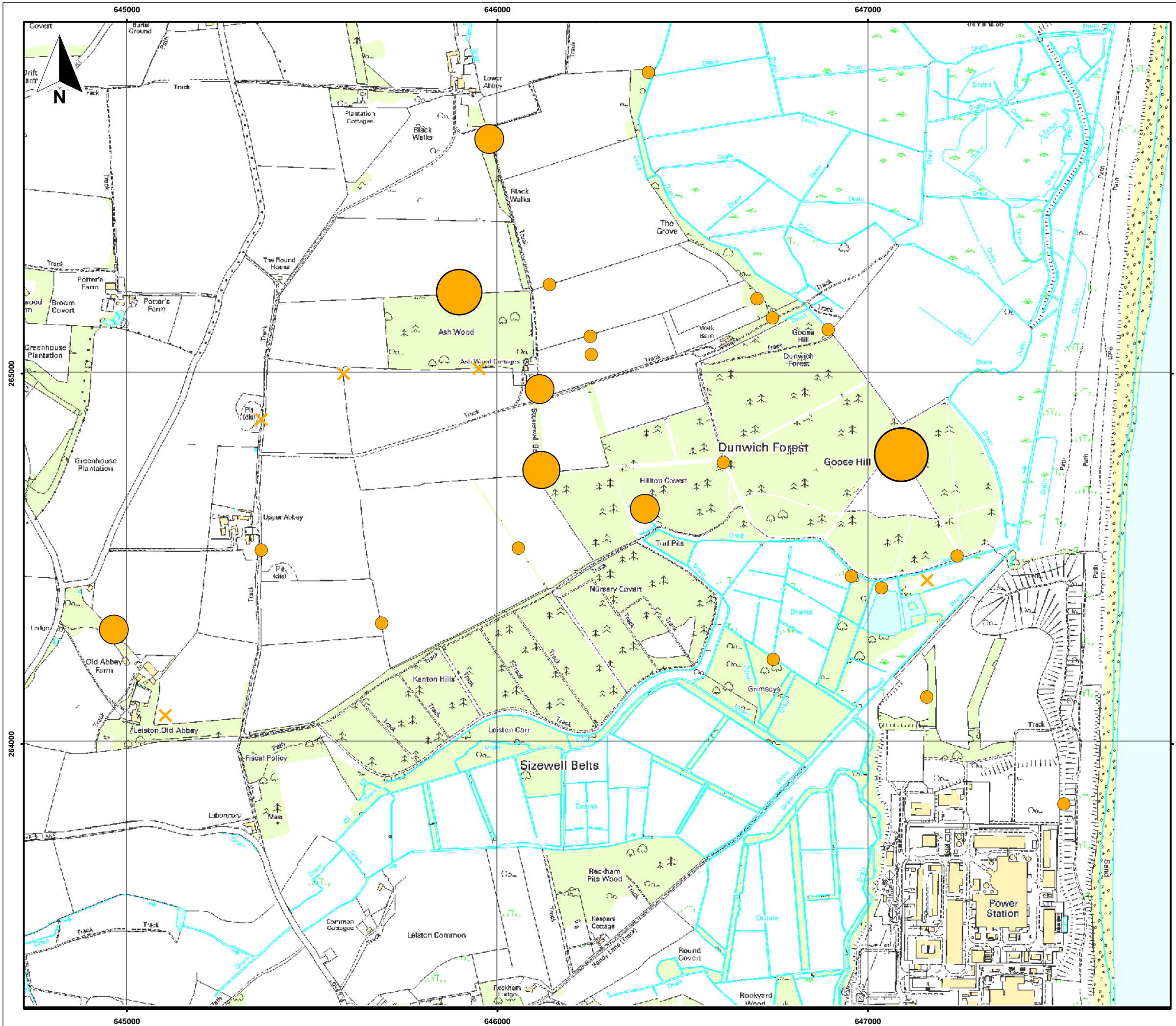
Sizewell Bat Report 2011

Figure E31
Relative activity (B/h) of serotine/Leisler's bat at static locations - spring (P1)

January 2011
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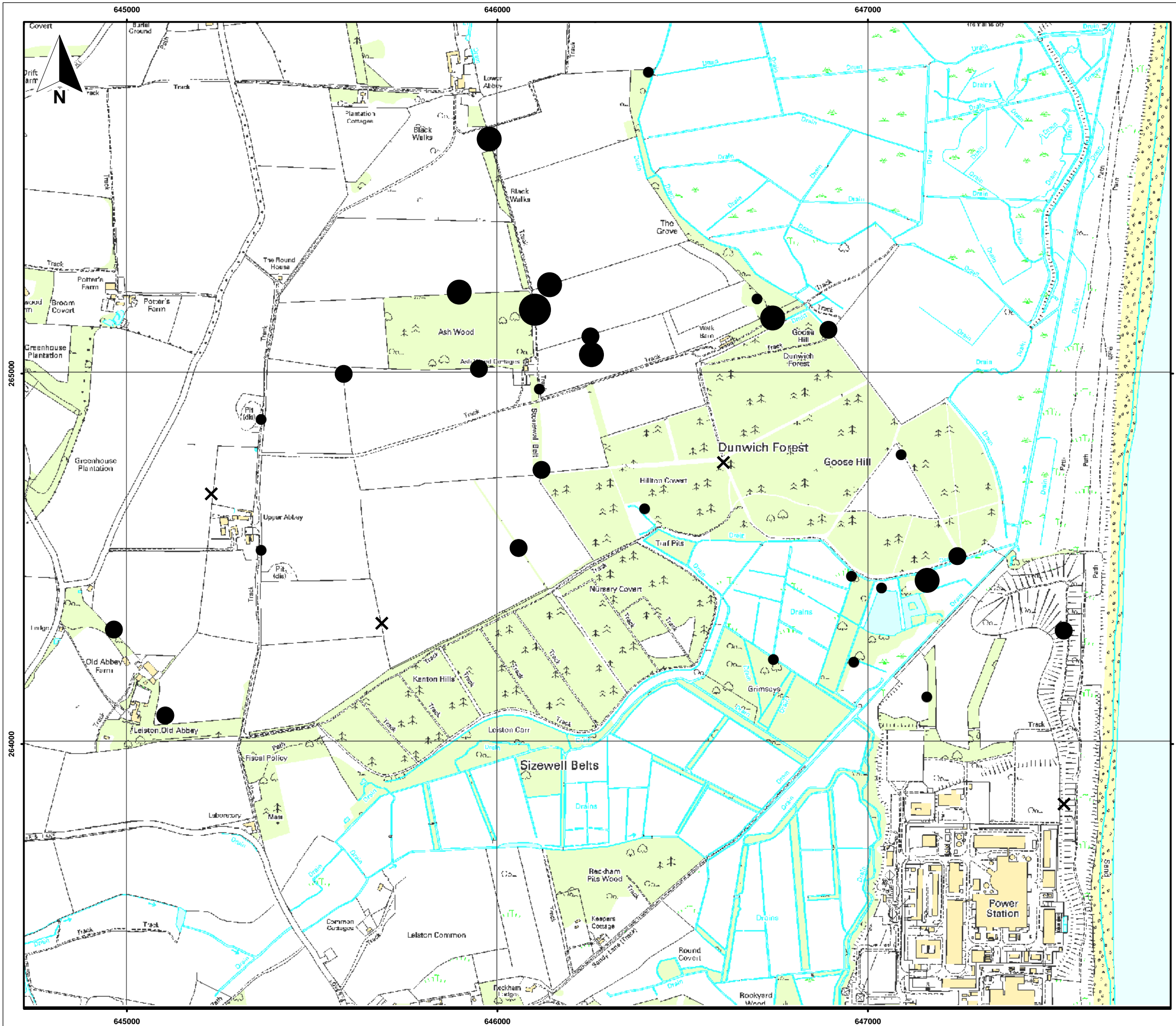
Sizewell Bat Report 2011

Figure E32
Relative activity (B/h) of serotine/Leisler's bat at static locations - summer (P2)

January 2011
28130-A324.mxd tugwc



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- Key:**
- X No bats recorded
 - 0.01 - 0.10
 - 0.11 - 0.25
 - 0.26 - 0.50
 - 0.51 - 1.13

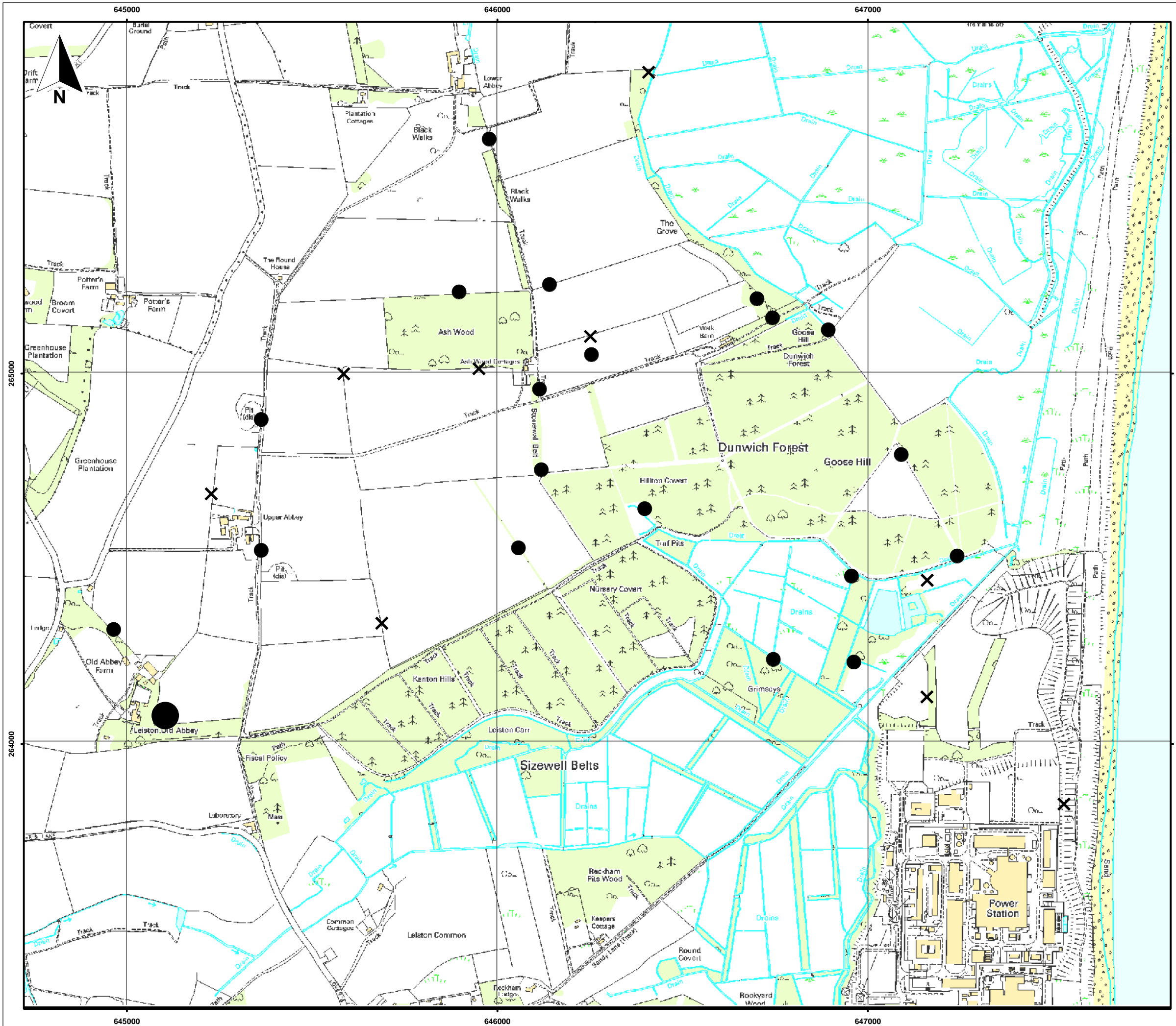
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Sizewell Bat Report 2011

Figure E33
 Relative activity (B/h) of brown long-eared bat at static locations in 2011

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- Key:**
- ✕ No bats recorded
 - 0.01 - 0.25
 - 0.26 - 0.35

0 50 100 200 300 Metres
Scale: 1:10,000 @ A3

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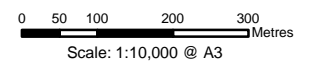
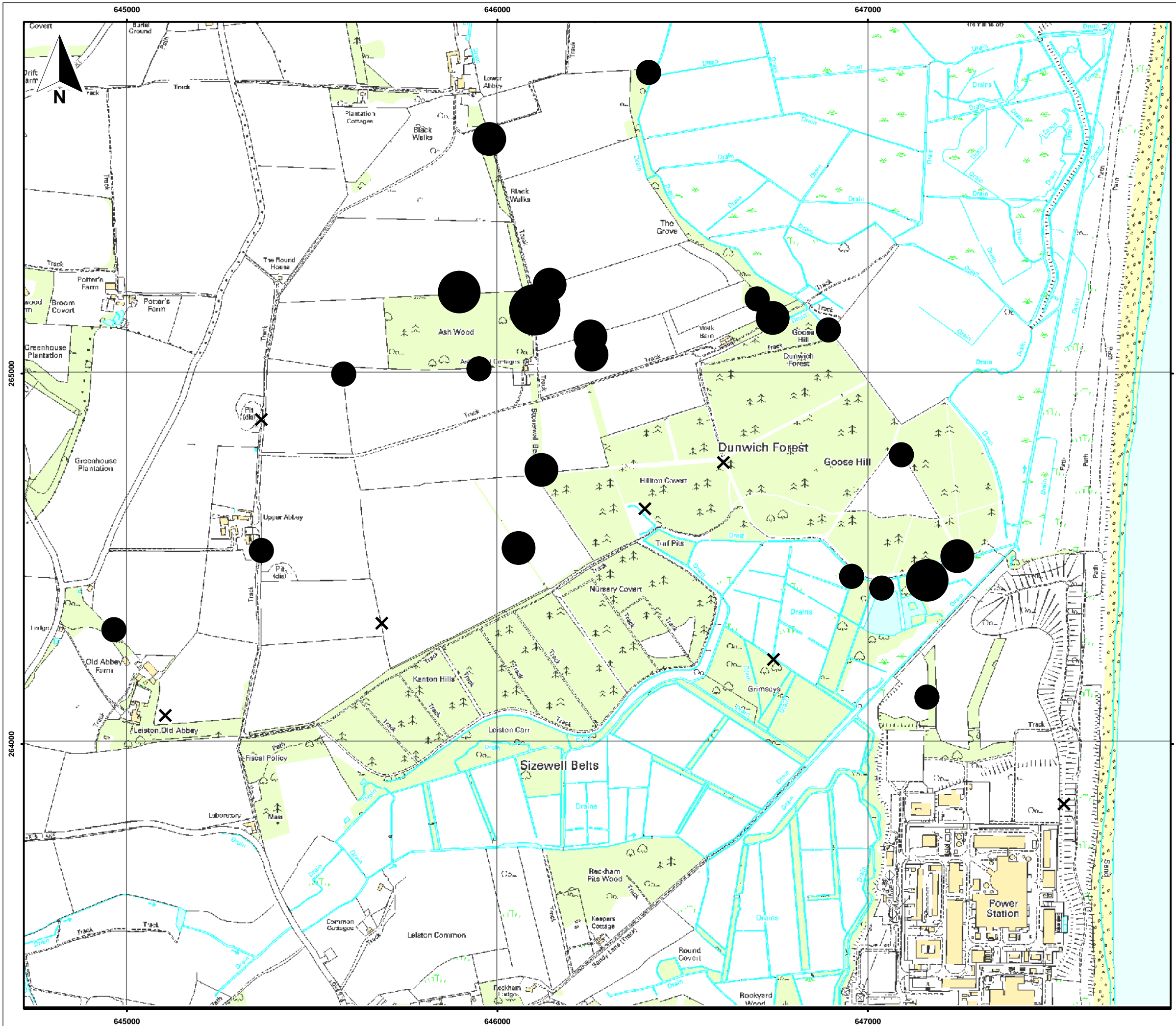
Sizewell Bat Report 2011

Figure E34
Relative activity (B/h) of brown long-eared bat at static locations - spring (P1)

January 2011
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Sizewell Bat Report 2011

Figure E35
Relative activity (B/h) of brown long-eared bat at static locations - summer (P2)

January 2011
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Sizewell Survey of Potential Bat Hibernation Sites in Buildings, January-March 2011

1. Introduction

Previous studies of bats on the Sizewell Estate have revealed that the large barn at Upper Abbey Farm (NGR TM 45307 64595) is used as a summer bat roost by several bat species including barbastelle (*Barbastella barbastellus*) and Natterer's bat (*Myotis nattereri*). The timbers, mortice joints and cladding of the barn, and to some extent other outbuildings on the site, also provide a large number of crevices that have the potential to be used by bats during the hibernation period. In addition, during survey work in 2010 a disused WW2 bunker was discovered just east of Leiston Old Abbey (NGR TM 45084 64051). Such structures frequently offer suitable conditions for hibernating bats. In order to inform the ongoing study of use of the site by bats throughout different seasons, therefore, both structures were surveyed during the winter for hibernating bats.¹

2. Methodology and personnel

The two sites were inspected on 31 January 2011 by a bat ecologist licensed by Natural England (NE) to disturb hibernating bats (Lynn Whitfield, licence no. 20110552). A focused-beam light source and, where there was no possibility of unduly disturbing bats, an endoscope (Ridgid SeeSnake Micro) were used to inspect the interior of the bunker and any accessible crevices within both structures for hibernating bats. In addition, the temperature and relative humidity (RH) inside the bunker were measured (ETI8711 Therma-hygrometer) and compared with those outside, to help gauge whether conditions within the bunker were suitable to support hibernating bats (which require a high humidity to prevent dehydration, and a steady low temperature maintained above freezing point). A second survey visit was planned for late February, but the weather during this period turned unusually mild, which may have induced bats to leave hibernation roosts. The second inspection was therefore conducted on 8 March 2011 following a spell with freezing nighttime temperatures

3. Results

3.1 Upper Abbey barn

No bats were found during inspections of the barn or adjacent outbuildings; however, there are a large number of potential crevice roosts that were impossible to access, and it was felt likely that at least some of these would be used by bats in winter. This was confirmed when some repair work to the cladding on the barn was carried out in February 2011, and two bats were

¹ It should be noted that these are unlikely to be the only bat hibernation sites at Sizewell; woodland bat species frequently use well insulated cavities in trees as hibernacula, and many species roost in the same buildings during summer and winter, in inaccessible locations such as under hanging tiles or within soffit boxes or cavity walls. However, it is extremely difficult to detect bats in these locations.

discovered roosting – a barbastelle

3.2 Bunker

The bunker is L-shaped in plan, approximately 2m high and 1m wide, and lined with corrugated metal sheeting. The southern arm is approximately 14m long and the northern 8m long. It is largely buried, with steps leading down to entrances at each end, the doors to which are wedged open; an open hatch above the bend in the structure is accessible by ladder (see photographs in Appendix A). The interior is therefore quite well lit and draughty, and is unlikely to have a stable temperature or high humidity. This was confirmed by the measurements made on 31 January (temperature and RH internally 3.2°C and 70%; externally 2.8°C and 70%). There are however some narrow crevices formed by the joins between wall sections and at the ends of the bunker, the latter being partially obscured by the open doors. No bats were found during the first visit, but a single brown long-eared bat (*Plecotus auritus*) was found in a crevice in the centre of the bunker on 8 March.

A large hole had been excavated under one wall of the bunker near the northern end. Although the sand lining the floor was too soft to retain footprints, and there were no other signs to indicate whether this was dug by a fox (*Vulpes vulpes*) or badger (*Meles meles*), holes in the woods nearby were of the size and shape typical of badger sett entrances, suggesting this may also be a sett entrance.

4. Conclusions and recommendations

It has been confirmed that both the large barn at Upper Abbey Farm and the bunker near Leiston Old Abbey are utilised by bats as winter roosts. Given the large size and number of potential roost crevices in the barn, this may well be an important hibernation roost. The bunker on the other hand is currently only suitable to support a small number of bats. Nevertheless, as these are bat roosts, Natural England should be consulted prior to any works to either structure that may contravene the legislation protecting these species.

If measures to improve the site for bats are being considered in the future, the bunker could be converted into a much more suitable hibernation site with potential to be used by a range of species, by measures to reduce the air flow and light levels within, and to provide additional roosting crevices.

Author: Lynn Whitfield

.....

Reviewer: Emma Toovey

.....

March 2011

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EDF Energy

Upper Abbey Farm, Leiston: Ecological Appraisal Report



AMEC Environment & Infrastructure UK Limited

February 2013

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No.	Details	Date
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Report for

Ben Malfroy
Head of Estates
EDF Energy
Atlantic House
Henson Road
Three Bridges
Crawley
Sussex
RH10 1QQ

Main Contributors

Lynn Whitfield

Issued by

Lynn Whitfield


.....

Approved by

Richard Knightbridge


.....

**AMEC Environment & Infrastructure
UK Limited**

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

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EDF Energy

Upper Abbey Farm, Leiston: Ecological Appraisal Report

AMEC Environment & Infrastructure
UK Limited

February 2013

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Appendix A	Summary of Relevant Legislation Relating to Protected Species
Appendix B	Photographs
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1. Introduction

1.1 Background

EDF Energy (EDF) is to apply for listed building consent (LBC) to repair and refurbish a farmhouse at Upper Abbey Farm near Leiston, Suffolk (OS grid reference TM45327 64539). The farmhouse (hereafter referred to as 'the site') dates from the 17th/18th Century and was partially destroyed by fire in December 2009.

Recent ecological studies carried out by AMEC E&I UK (AMEC) in connection with the proposed development of a new nuclear power station at Sizewell have shown that a number of legally protected faunal species, including several species of bat and reptile, occur in the area surrounding the farmhouse. As the house has been left unoccupied since the fire, it could have become colonised by bats and nesting birds, while the surrounding vegetation could support further species including bats, nesting birds and reptiles.

Given the potential for the proposed refurbishment to affect protected species, biological survey data are required to confirm whether and how such species would be affected by the refurbishment. Furthermore, the LBC application needs to include details of how such effects will be mitigated during the proposed works in order to avoid contravention of the legislation protecting these species¹.

In addition, all bats are European Protected Species (EPS), protected under the UK "Habitats Regulations" (see Appendix A). Should the proposed works be likely to contravene this legislation, a derogation licence will be required from Natural England (NE) in advance of refurbishment. Any consents relating to the work, including LBC, normally need to be in place prior to application for such a licence, although in certain "exceptional circumstances" (see guidance provided by NE²) it is possible for an application to be processed prior to consent being granted. However, the consent would still need to be in place before works affecting the protected species could commence.

In the light of these requirements, AMEC was commissioned by EDF to survey the site in order to determine the potential of the farmhouse and its surrounds to support protected species, and to make recommendations for any further survey, assessment work and mitigation measures that are required to support the LBC application, and also any application to Natural England for an EPS licence.

¹ A summary of the relevant legislation is provided in Appendix A.

² http://www.naturalengland.org.uk/Images/wml-g12_tcm6-4116.pdf



1.2 Purpose of this Report

The remainder of this report presents a summary of the relevant biological data for the area surrounding the site, and the methods for and results from a series of autumn/winter surveys of the site. An assessment of the likely effects of the refurbishment on protected species, recommendations for further survey work, and the mitigation measures and licensing that are deemed to be required in connection with legally protected species are also provided. This information will provide EDF with the information required to take forward the planned refurbishment without the likelihood of breaching protected species legislation.

2. Methods

2.1 Desk Study

The site is located within EDF's Sizewell Estate. An extended phase 1 habitat survey and an intensive series of phase 2 ecological surveys and desk studies for species which are legally protected or otherwise notable in terms of biodiversity were carried out by AMEC across the Estate between 2007 and 2012. These included:

- Bat surveys, including trapping and radio-tracking studies;
- Ornithological surveys;
- A reptile population survey, and
- A great crested newt presence/absence survey.

A plan showing the extent of the Sizewell estate and the location of Upper Abbey Farm is provided in Figure 2.1 (Appendix C). The results of these surveys were reviewed, and relevant information on protected species which could be affected by the refurbishment works at Upper Abbey Farm extracted.

2.2 Field Surveys

2.2.1 Bat survey

The site was initially inspected on 5 October 2012 by Dr Lynn Whitfield MIEEM, an AMEC ecologist specialising in bats; Lynn has 7 years' experience in ecological consultancy and holds a Natural England survey licence for bats (licence no. 20130131; includes disturbance of hibernating bats). The survey involved the use of powerful binoculars to identify potential entrances into bat roost sites, such as gaps in tiles and soffits, and holes, splits and exfoliating bark in mature trees near the building. A powerful focused-beam light source was used to search dark interiors and crevices around the building for bats or signs of bats such as droppings, staining from urine or fur, and an absence of cobwebbing in suitable crevices. A Ridgid SeeSnake narrow-bore endoscope was also available for use in examining whether any deeper crevices contained roosting bats.

Further inspections of the cellar and ground floor areas of the farmhouse and the adjacent outbuilding were carried out by the same surveyor on 6 November 2012, 20 November 2012, 18 December 2012 and 28 January 2013. The December and January visits were planned to coincide with periods of very cold weather, when bats would be likely to be occupying hibernation roost sites.



All surveys were carried out in accordance with current best practice guidance³.

2.2.2 Ecological Appraisal of Surrounds

A walkover survey of the small, overgrown garden surrounding the farmhouse was carried out by Dr Whitfield on 5 October 2012, to assess its potential to support protected or otherwise notable species.

³ Hundt, L. (ed.). (2012). *Bat Surveys – Good Practice Guidelines*, 2nd edition. Bat Conservation Trust, London.

3. Results

3.1 Desk Study

There are records of the following species within the immediate vicinity of the site, on the Sizewell Estate.

- Bats: common pipistrelle (*Pipistrellus pipistrellus*), soprano pipistrelle (*P. pygmaeus*), Nathusius' pipistrelle (*P. nathusii*), Daubenton's bat (*Myotis daubentonii*), Natterer's bat (*Myotis nattereri*), brown long-eared bat (*Plecotus auritus*), noctule (*Nyctalus noctula*), Leisler's bat (*N. leisleri*), serotine (*Eptesicus serotinus*) and barbastelle (*Barbastella barbastellus*).
- Common reptiles: viviparous lizard (*Zootoca vivipara*), slow worm (*Anguis fragilis*), grass snake (*Natrix natrix*) and adder (*Vipera berus*).
- A range of woodland and farmland bird species, including common species likely to nest in domestic buildings and gardens.

3.2 Bat Survey of Farmhouse

3.2.1 External Inspection

Photographs of the site are provided in Appendix B. The farmhouse is a two-storey building with brick walls with no cavity, and a pitched roof, which is clad in pantiles. The roof of the front (southern) section is almost completely missing as a result of the fire, and this section is surrounded by scaffolding supporting a polythene covering to protect the interior from rain (Photograph 1). The roof of the separate rear (northern) section is mainly intact, with a few tiles missing from both roof pitches (Photograph 2). The walls and windows of this section are also intact.

3.2.2 Internal Inspection, Southern Section

The ground-floor ceiling in the southern section is mainly intact, and this ground-floor and a cellar below it could be readily accessed by the surveyor. However, the upper floors are badly fire-damaged and only partly accessible (Photograph 3). Opportunities for bats to roost during the day in the floors above the cellar are limited to a few dark areas and cupboards on the ground floor, and a few crevices in the woodwork of the upper floors that has been exposed by fire damage; it was not possible closely to inspect the latter for health and safety reasons.

The cellar comprises a number of rooms with open doorways between them, and is dark and damp within, with shallow water flooding the floor in parts. Numerous crevices in the

brickwork and the walls of the room provide suitable roosting sites for bats, including during the winter when the conditions (constant temperature and high humidity) are likely to provide ideal conditions for hibernating bats.

No evidence of bats was found in the first floor area. The only evidence of roosting bats found on the ground floor was a collection of moth wings and bat droppings on the floor of a small porch at the southern end of the building which has been boarded up (Photograph 4), and a single bat dropping on the wall just below a crevice between the porch and house. However, there were no bats in this crevice at the time of the survey visits..

From their size and shape, the droppings on the porch floor are likely to be from brown long-eared bat. This is indicative of a feeding perch, where bats hang at intervals during the night to consume and digest prey items.

Bats were found roosting in the cellar during four of the five survey visits.

- 5 October 2012: a single bat was found roosting in a crevice in the brickwork; the species could not be confirmed as only part of the body could be seen, but it was one of the *Myotis* group, likely (based on the features that could be seen and the species known to occur in the area) to be a Daubenton's bat;
- 6 November 2012: a single Daubenton's bat was found roosting in a different crevice, above a doorway between two sections of the cellar;
- 18 December 2012: a single bat was found roosting in a third crevice - the species could not be confirmed as only a small part of the bat could be seen;
- 28 January 2013: a single bat was found roosting in the same crevice as that occupied on 18 December, with enough of the feet and tail visible to confirm that it was not a Daubenton's bat, and was probably a brown long-eared bat. In addition, two Natterer's bats were found in a further two crevices.

The locations where the bats were found are shown on the plans in Figure 3.1 (Appendix C). The southern section is labelled as Unit 1 in these plans.

3.2.3 Internal Inspection, Northern Section

The ground and first floors of the northern section contain intact, unboarded windows and are therefore mostly well lit and not suitable for bats. No signs of bats were found on these floors.

The roof void comprises a dormer section, again well lit with no signs of bats, and a small, dark roof void at the northern end, where the 2.5-3m high roof pitch is lined with bitumastic roofing felt over wooden boarding. The angles between the apex ridge board and the roof, where bats would typically roost, were largely cobwebbed, suggesting no recent use by bats, although there were two areas with fewer cobwebs, and 2-3 old bat droppings were found here.

A dead tawny owl (*Strix aluco*) was found in the dormer area; this is likely to have entered the building prior to gaps in the roof being sealed with plastic sheeting. No gaps large enough to permit owls to enter the building currently exist.

3.3 Survey of Farmhouse Surrounds

The former garden/driveway area around the building comprises a number of planted trees and shrubs, as well as unmanaged grassland, which is likely to have developed from lawns that have become overgrown. The grassland is dominated by grasses including cock's-foot (*Dactylis glomerata*) and Yorkshire fog (*Holcus lanatus*), with large patches of tall herbs around the edges, dominated by common nettle (*Urtica dioica*) and creeping thistle (*Cirsium arvense*), and some low scrub.

The trees close to the house, which include holm oak (*Quercus ilex*), sycamore (*Acer pseudoplatanus*), Leyland cypress (*x Cupressocyparax leylandii*) and cherry laurel (*Prunus laurocerasus*), are relatively young and contain no features suitable as bat roosts sites. The only tree providing suitable features in this respect is a large mature pedunculate oak (*Quercus robur*) on the garden boundary between the house and the field to the east. This tree has snags and splits in several of the upper limbs (Photograph 5); the foliage may have obscured further features of this kind.

To the east of the house, there is a small garden shed constructed from brick and stone, with a pan-tiled roof. The shed door was open at the time of the survey visits, and there were a few crevices within that would provide suitable habitat for roosting (especially hibernating) bats. However, these crevices were filled with cobwebs when inspected during each of the survey visits, indicating that they were not being used by bats.

The trees, shrubs and scrub, the dilapidated parts of the building and the outbuilding provide suitable habitat for nesting birds. The rough grassland and scrub provide a small amount of suitable habitat to support common reptile species.

4. Conclusions and Recommendations

4.1 Bats

The farmhouse has been demonstrated to support small autumn/winter roosts of at least three bat species, namely Natterer's bat, Daubenton's bat and brown long-eared bat, with evidence of a feeding roost and a small crevice roost, the former likely to be used by brown long-eared bat. Based on historical records of bats from the area, the building also has the potential to support roosts of common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, noctule (*Nyctalus noctula*), Leisler's bat (*N. leisleri*), serotine (*Eptesicus serotinus*) and barbastelle (*Barbastella barbastellus*), although it is very rare to find noctule roosting in buildings, and rare to find barbastelle summer roosts in domestic buildings. However, the small number of crevices in the roof and upper floors that would provide roosting habitat, the lack of heating in the building, the shaded nature of the intact roof and the dearth of evidence of bats in the only intact roof void suggest that any summer roosts present are likely to be very small, non-breeding roosts. (Maternity colonies generally require very warm roosting areas for at least part of the breeding period.)

The small outbuilding has some potential as a bat roost, but no evidence of hibernating bats has been found. The building appears unsuitable as a summer day roost although it could be used as a nighttime feeding perch. The only tree likely to be suitable as a roost site is the large oak on the edge of the garden, which is well away from the house and will not be affected by the planned works.

As the farmhouse provides some suitable habitat for summer as well as winter bat roosts, further surveys are recommended in order to provide the remainder of the information that is needed to support an EPS licence application. These should comprise further internal and external inspections, and dusk emergence/dawn re-entry surveys using aural bat detectors, including at least one survey within the optimum survey period (late May-July).

In order to obtain a derogation licence for works affecting bats, a Reasoned Statement will need to be submitted to NE which details how the following three tests are to be met:

- That the proposed works are required in order to preserve human health or human safety, or for other imperative reasons of overriding public interest, including those of a social or economic nature;
- That there is no satisfactory alternative to the works; and
- That the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range.

A Method Statement will also need to be submitted, indicating how the bat population will be maintained and harm to bats avoided. This will include a methodology for ensuring that bats are not harmed during the refurbishment works, and a description of how the current roost sites will be either maintained or compensated for. To avoid harm to bats, it is recommended that the following elements should be incorporated into the refurbished building and associated works:

- Retention of part of the cellar as a bat hibernaculum, with a suitable entrance built into the external door to the cellar to provide bat access, and Norfolk bat bricks⁴ or similar incorporated into the cellar to provide additional roost sites;
- Retention of the external porch, with an opening in one side, so that the feeding perch and crevice roost between the porch and house can be maintained;
- Incorporation of crevice-type roost boxes (e.g. Habibat boxes⁵) into rebuilt outer walls, to replace any current summer roosts that may exist under roof tiles (and to replace the crevice roost in the porch if that cannot be retained);
- If the porch cannot be retained, retention and repair of the small outbuilding as a feeding roost and possible hibernation/day roost;
- Provision of an isolated, dark roof void with a bat entrance in the roof or eaves;
- Avoidance of nighttime lighting of all bat roosts and roost exits, and likely flightlines leading from the roosts to adjacent foraging habitat;
- If chemical treatment of any existing woodwork is required, only products approved by Natural England as being safe to use in bat roosts should be utilised, and treatments should only be carried out when bats are not present.

It is likely that these measures would more than compensate for the loss of any summer roosts that may be found through further survey work, as well as mitigating any effects on known roosts. The measures are therefore likely to ensure the maintenance of the local bat populations at favourable conservation status and, consequently, it would be reasonable for the local planning authority to grant consent for the works provided that the above measures are incorporated into the LBC application (and provided that there are no non-ecological reasons not to grant consent).

4.2 Reptiles

Small numbers of common reptiles including viviparous lizard, slow worm, grass snake and adder could occur within the scrub and ruderal vegetation in the garden during the summer, and use any piles of brash, logs, rubble etc. as hibernation sites during the winter. It is understood that only limited gardening works will be carried out, which are unlikely to cause harm to reptiles. However, it is recommended that the vegetation around the building, in areas likely to

⁴ http://www.nhbs.com/norfolk_bat_brick_tefno_187603.html

⁵ <http://www.habibat.co.uk/>

be used by vehicles and plant associated with the proposed works, is kept trimmed or mown short throughout the refurbishment, to encourage any reptiles out of these areas, and thus avoid harming or killing them.

If any large-scale clearance of the grounds involving grubbing out of vegetation is planned in the future, it is recommended that ecological advice is sought, in order that a method statement can be put in place to avoid possible contravention of the legislation protecting reptiles. Given the small amount of habitat involved, however, even complete removal would not be likely to have a significant effect on local populations of these species.

4.3 Nesting birds

The trees, shrubs and scrub in the garden area could support nesting common garden birds. It is understood that only limited pruning works and possible removal of small ornamental trees close to the building will be carried out. In order to avoid contravening the legislation protecting nesting birds, such works should be carried out outside of the nesting season (which is typically March-August inclusive) if possible. If vegetation removal has to be undertaken within the nesting period, it should be preceded by a check for active nests; if a nest is present, it must be left in situ until either it is abandoned or the young have fledged.

The dilapidated parts of the building and the outbuilding also provide potential nesting sites. Therefore, if any works to these structures are planned during the nesting season, it is recommended that measures are taken to discourage birds from nesting if possible. Such measures must not, however, obstruct the exits from any bat roosts and may therefore be difficult to implement in advance of licensed bat exclusion.

Appendix A

Summary of Relevant Legislation Relating to Protected Species

Bats

All British bat species are listed in Schedule 5 of *The Wildlife and Countryside Act 1981* (as amended). The Act transposes into UK law the Convention on the Conservation of European Wildlife and Natural Habitats (commonly referred to as the ‘Bern Convention’). All British bat species are listed on Schedule 5 of the Act in respect of Section 9, which makes it an offence, *inter alia*, to:

- Intentionally or recklessly kill, injure, or take (handle) a bat;
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place that a bat uses for shelter or protection; and
- Intentionally or recklessly disturb a bat while it is occupying a structure or place that it uses for shelter or protection.

British bat species receive further protection under Regulation 41 of *The Conservation of Habitats and Species Regulations 2010*, which make provision for the purpose of implementing European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992. All British bat species are listed on Annex IV of the Directive, which means that member states are required to put in place a system of strict protection as outlined in Article 12, and this is done through inclusion on Schedule 2 of the Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture, injure or kill any bat;
- Deliberately disturb a bat, in particular any disturbance which is likely:
 - (a) to impair their ability;
 - (i) to survive, to breed or reproduce, or to rear or nurture their young, or
 - (ii) to hibernate or migrate;
 - (b) to affect significantly the local distribution or abundance of the bat species; or
- Damage or destroy a breeding site or resting place of a bat.

In addition, five British bat species are listed on Annex II of the *Habitats Directive*. These are:

- Greater horseshoe bat (*Rhinolophus ferrumequinum*);
- Lesser horseshoe bat (*Rhinolophus hipposideros*);
- Bechstein’s bat (*Myotis bechsteinii*);

- Barbastelle (*Barbastella barbastellus*); and
- Greater mouse-eared bat (*Myotis myotis*).

As Annex II species under the Habitats Regulations, the Directive requires the designation of Special Areas of Conservation (SACs) by EC member states to ensure that their populations are maintained at a favourable conservation status. Where bats occur outside SACs the level of legal protection that these species receive is the same as for other bat species, however their inclusion on Annex II serves to underline their conservation significance and it is therefore less likely that adequate mitigation for loss of roosts of these species will be possible.

Birds

With certain exceptions⁶, all wild birds, their nests and eggs are protected by the *Wildlife and Countryside Act 1981* (as amended). Therefore, it is an offence, *inter alia*, to:

- intentionally take, damage or destroy the nest of any wild bird while it is in use or being built; or
- take or destroy the egg of any wild bird.

Bird species listed on Schedule 1 of the Act receive further protection, thus for these species it is also an offence to:

- disturb any bird while it is nest building, or is at a nest containing eggs or young; or
- disturb the dependent young of any such bird.

Reptiles

The four widespread⁷ species of reptile that are native to Britain, namely common lizard, slow worm, adder and grass snake, are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded limited protection under Section 9 of this Act. This makes it an offence, *inter alia*, to intentionally kill or injure any of these species.

⁶ Some species, such as game birds, are exempt in certain circumstances

⁷ The two other native species of British reptile (sand lizard *Lacerta agilis* and smooth snake *Coronella austriaca*) receive a higher level of protection under the *Wildlife and Countryside Act 1981* (as amended). However, the distribution of these species is restricted to only a very few sites.

Appendix B Photographs

Photograph 1 Burnt-out southern section of house



Photograph 2 Example of tiles missing from northern section roof



Photograph 3 Example of fire damage with exposed crevices.



Photograph 4 Bat droppings and moth wings in porch, indicating a bat feeding perch



Photograph 5 Large mature oak to east of farmhouse





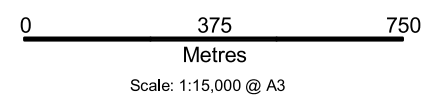
Appendix C

Figures



Key:

- 2007-2012 Sizewell Estate survey area boundary
- Upper Abbey Farm



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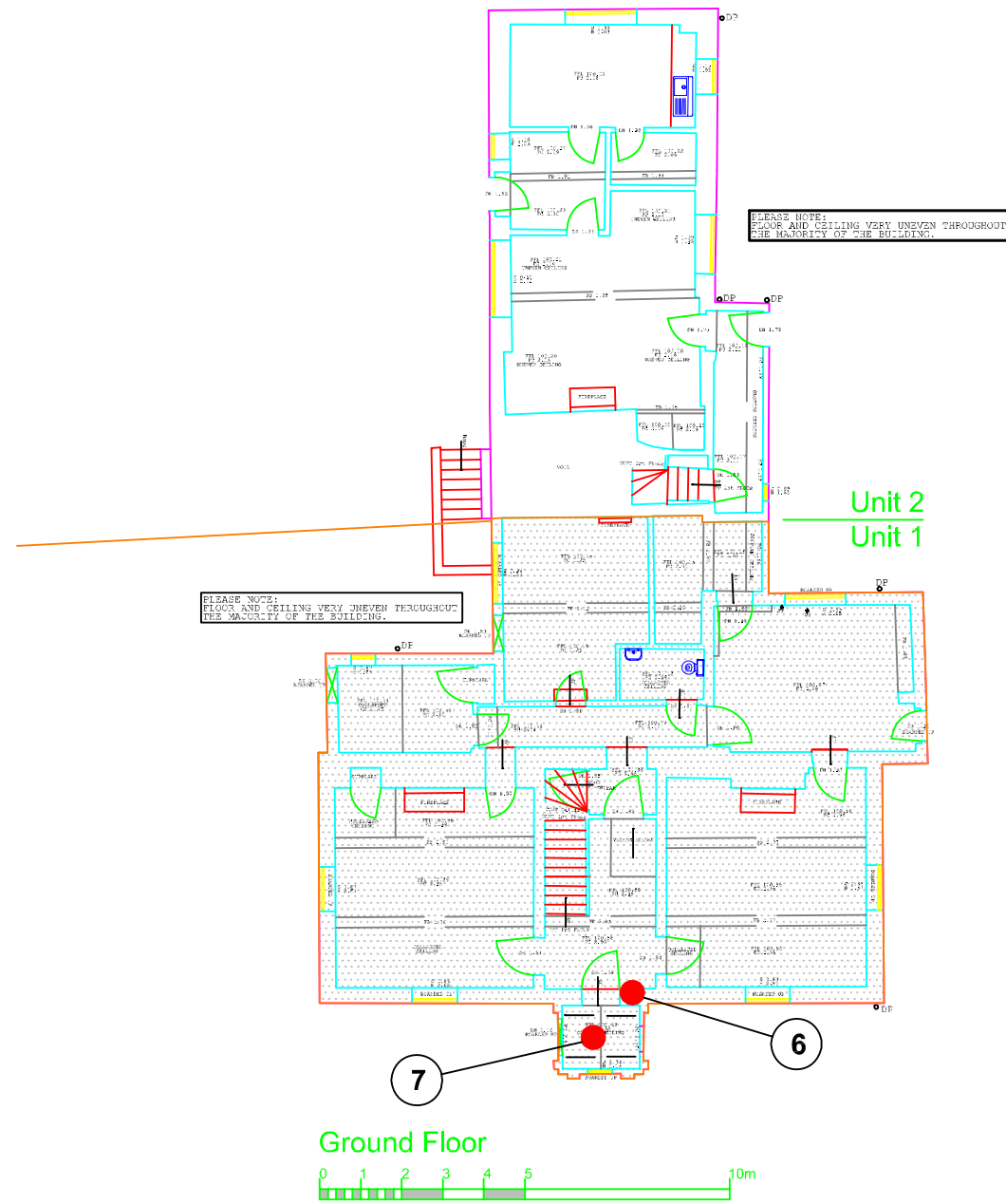
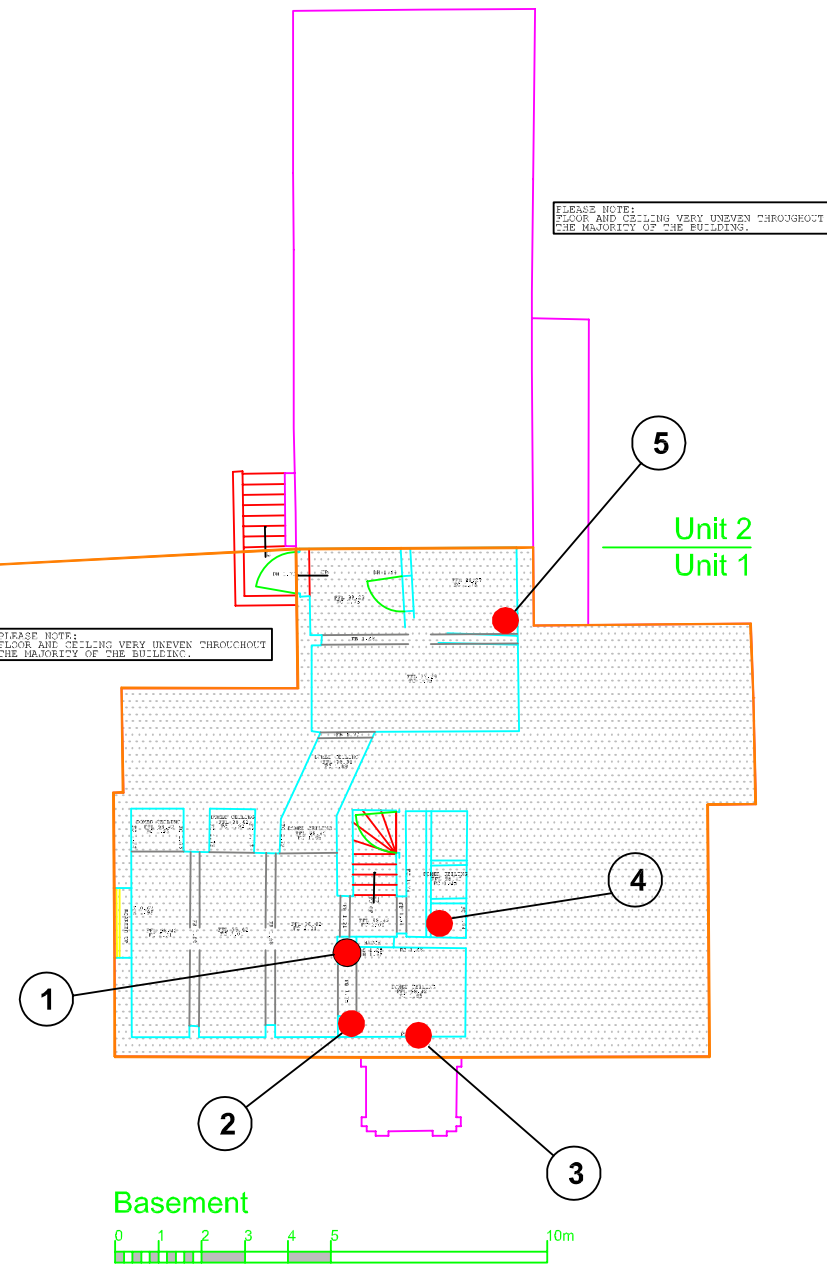


Upper Abbey Farm, Leiston,
Ecological Appraisal Report

Figure 2.1
Upper Abbey Farm
Location in relation to Sizewell Estate

February 2013
28130-A478.mxd tugwc





Key

- Locations of roosting bats/evidence of bats
- 1 - 05/10/12: *Myotis* (likely Daubenton's bat)
- 2 - 06/11/12: Daubenton's bat
- 3 - 18/12/12, 28/01/13: Likely brown long-eared bat
- 4 - 28/01/13: Natterer's bat
- 5 - 28/01/13: Natterer's bat
- 6 - Crevice between porch and wall with single bat dropping on wall below
- 7 - Bat droppings and moth wings on floor of porch



Upper Abbey Farm, Leiston,
Ecological Appraisal Report

Figure 3.1
Upper Abbey Farm - Results of
autumn/winter bat survey

February 2013
28130_A479.dwg tugwc



Royal Haskoning

**Sizewell Power
Station ISFSI and Car
Park Extension**

Ecological Scoping Report

September 2008

Entec UK Limited

Report for

Jon Allen
Rightwall House
Bretton
Peterborough
PE3 8DW

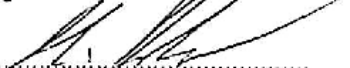
Main Contributors

Gemma Lee

Issued by


.....
Gemma Lee

Approved by


.....
Mike Barker

Entec UK Limited

155 Aztec West
Almondsbury
Bristol BS32 4UB
England
Tel: +44 (0) 1454 822000
Fax: +44 (0) 1454 822010

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Royal Haskoning

Sizewell Power Station ISFSI and Car Park Extension

Ecological Scoping Report

September 2008

Entec UK Limited



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Document Revisions

No.	Details	Date
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Executive Summary

Purpose of this Report

This report has been produced for the purpose of defining the proposed scope of the Environmental Impact Assessment (EIA) for the new independent spent fuel storage installation (ISFSI) and west car park extension at Sizewell 'B' Power Station, Suffolk. The scheme and the relevant policies and guidance are described briefly. The report then lists the main sources of information used and summarises the existing baseline information available. It then uses this information, in combination with the results of a targeted Phase 1 Habitat Survey, to define the scope of the assessment.

The aim of the scoping report is to inform and seek to establish the formal view of statutory consultees with regard to the ornithological and terrestrial ecological information that would be necessary to form the basis for an EIA of the proposed development. With this in mind, we would like to establish:

- whether there are other ecological issues that should be taken into account;
- whether they think there are any other ecological receptors that could be significantly affected and that should therefore be taken into account;
- whether they have any comments on the programme and methodologies for survey and assessment set out here.

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1. Introduction

1.1 Scheme Description

The proposed development comprises two components;

- the creation of a new independent spent fuel storage installation (ISFSI) to the south of the existing Sizewell 'B' Power Station (located on an existing car park); and
- a car park extension to the north of the existing western car park servicing Sizewell 'B' (to replace the car park lost as a result of the ISFSI).

The location of the proposed development site is shown in **Figure 1.1**.

1.2 Policy Context and Guidance

In addition to taking into account The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999, particular regard would also be given to the requirements of, and advice given in:

- PPS9, which sets out planning policies on the protection of biodiversity and geological conservation (PPS9 replaces Planning Policy Guidance 9 [PPG9] "Nature Conservation" (1994), which has been formally cancelled). PPS9 lists several key principles to ensure that the potential impacts of planning decisions on biodiversity (and geological conservation) are fully considered. These include:
 - planning decisions should be based on contemporary environmental information;
 - planning decisions should aim to maintain and enhance, restore or add to biodiversity, with appropriate weight given to designated sites, protected species and biodiversity within the wider environment;
 - the aim of planning decisions should be to prevent harm to biodiversity.
- The companion guide to PPS9 dealing with good practice when considering biodiversity and geological conservation (Planning for Biodiversity and Geological Conservation – a Guide to Good Practice);
- The Conservation (Natural Habitats, &c) Regulations 1994 (as amended);
- Wildlife and Countryside Act 1981, as amended;
- The UK Biodiversity Action Plan (UK BAP); and
- The Suffolk Local Biodiversity Action Plan (LBAP).

The approach taken in regard to the ecology aspects of the EIA (the ecological impact assessment or EcIA) will be based on the Institute of Ecology and Environmental Management (IEEM) *Guidelines for Ecological Impact Assessment in the United Kingdom*, 2006. Entec has been a key contributor to the development of these guidelines, which have been endorsed by organisations including Natural England (NE), the Wildlife Trusts, the Environment Agency and the Institute of Environmental Management and Assessment (IEMA).

EcIA is a structured process through which habitats and species that need to be considered as part of an assessment are identified through scoping, desk study, and field surveys. It follows that the focus of the assessment can change as the process advances, with some issues assuming greater prominence than was initially envisaged and others being effectively scoped out. The Environmental Statement resulting from the EcIA does not consider effects on all species and habitats. Rather, it aims to establish the ecological receptors of greatest biodiversity value that could be affected by a development. The significance of the effect on any biodiversity receptor will be determined by consideration of the biodiversity value, conservation status, legal and policy status of the receptor, in combination with the predicted nature and scale of the effect upon it. The scale of effect on valued receptors will be quantified wherever possible.

The value of an ecological resource or feature will be determined within a defined and appropriate geographical context, e.g. a resource may be defined as of international, national, regional, or local importance, or may be important only in terms of its immediate zone of influence. The value of areas of habitat and plant communities will be measured against published criteria where available. In assigning value to species, it is necessary to consider distribution and status, including a consideration of population trends based on available historical records. Rarity is an important consideration because of its relationship with threat and vulnerability. Some species are inherently rare, so it is necessary to look at rarity in the context of status. A species that is rare and declining may be assigned a higher level of importance than one that is rare but known to have a stable population.

1.3 Appropriate Assessment

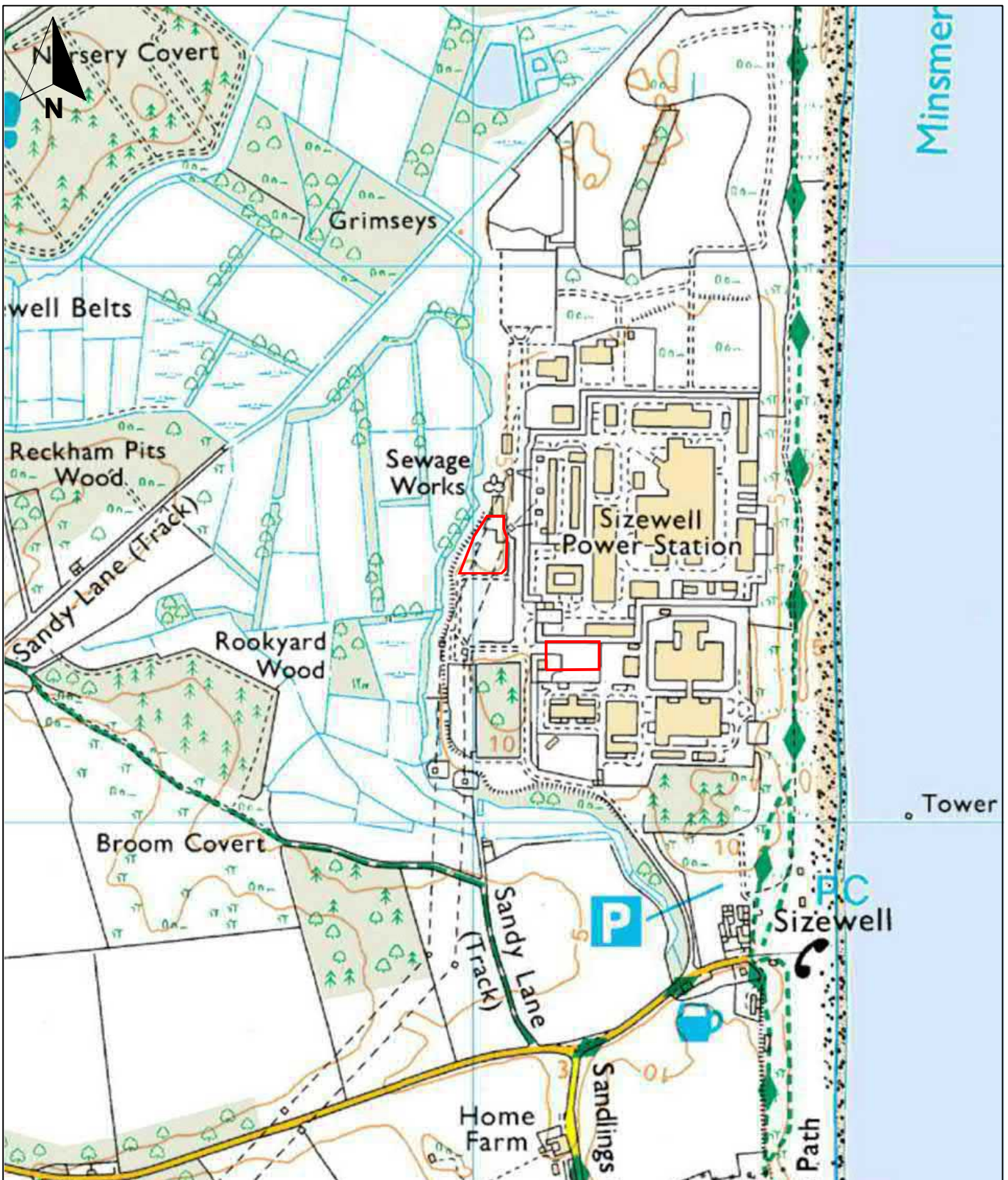
Under Regulation 48(1) of the Habitats Regulations (the primary legal instrument by which the EU Habitats Directive is transposed into UK law), an appropriate assessment of the implications for the designated site in view of its conservation objectives must be undertaken before consent can be given for a project that:

- either alone or in combination with other plans or projects would be likely to have a *significant effect* on a European Site, and
- is not directly connected with the management of the site for nature conservation,

A European Site is any Special Protection Area (SPA) and any Special Area of Conservation (SAC), and as a matter of Government policy potential SPAs, candidate SACs and listed Ramsar Sites are treated for development consenting purposes as if they were already fully designated.

Several European Sites occur within 2km proposed development (see below). However, based on the location of the development in relation to the existing Power Station, the relatively limited extent of the development and the likely construction methodologies, it is considered

that no likely significant effects could occur on the nearby European Sites. Therefore, an appropriate assessment is not required in relation to this scheme.



Key

- Proposed Development
- Site Boundary



Royal Haskoning
 Sizewell Power Station ISFSI
 and Car Park Extension

Figure 1.1
Proposed Development
Site Boundary



Scale 1:10,000 @ A4

September 2008
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2. Baseline Information

2.1 Sources of Baseline Information

A considerable amount of baseline ecological survey work has been conducted on the BE Estate at Sizewell during the past twenty-five years and this has been augmented more recently by detailed ecological survey work and desk study carried out by Entec in relation to the new nuclear build proposals at Sizewell. This scoping report draws on the information relevant to the current development proposals, that were collated for the new nuclear build scheme, which used the following main sources of information;

- the Multi-Agency Geographical Information System website (www.magic.gov.uk);
- Suffolk Wildlife Trust (SWT);
- Suffolk Biological Records Centre (SBRC);
- Royal Society for the Protection of Birds (RSPB);
- Natural England (NE);
- British Energy (including the Integrated Land Management Plan [ILMP] and studies undertaken by ecological consultants, SWT, the Environment Agency, universities and colleges, special interest groups and individuals; and
- the National Biodiversity Network (www.searchnbn.net).

2.2 Existing Baseline Information

2.2.1 Designated Sites for Nature Conservation

It is necessary to ascertain the proximity of statutorily designated sites of conservation importance to a proposed development in order that potential effects on these can be considered. Given the scale of the proposed development, it is considered effects on designated sites further than 2km from the scheme are highly unlikely and therefore a 2km search area around the works areas has been used. The positions of the designated sites in relation to the works areas are illustrated on **Figure 2.1**.

Internationally Designated Sites

The Minsmere to Walberswick Ramsar Site is approximately 1km to the north of the proposed works (car park extension). The site was designated on the basis of its mosaic of marine, freshwater, marshland and associated habitats and the transitional areas in between. It contains the largest continuous stand of reedbed in England and Wales and includes rare transitional communities from brackish to fresh water. It also supports nine nationally scarce plants and at least 26 red data book invertebrates. These include a population of the narrow-mouthed whorl

snail (*Vertigo angustior*) (a Habitats Directive Annex II and British Red Data Book Endangered Species). The Ramsar designation includes the same qualifying species and habitats as the coincident Minsmere and Walberswick SPA and SAC. The full citation is included as **Appendix A** of this report.

European Designated Sites

The closest site of European Importance for its habitats and bird populations is the Minsmere to Walberswick SPA approximately 1km to the north of the proposed works area (car park extension). The designation covers the same area as the Minsmere to Walberswick Ramsar Site and was classified on the basis of its breeding and wintering bird interest:

A further site of European importance for its bird populations, Sandlings SPA, is approximately 1km to the south-west of the proposed works (nearest to the ISFSI). This site qualifies under Article 4.1 of the EC Birds Directive 974/409/EEC) by supporting breeding nightjar and woodlark, both of which are listed on Annex 1 of the Directive. SPA Citations are contained in **Appendix B** of this report.

The Minsmere to Walberswick SAC, which covers the same area as the Ramsar Site and SPA, was primarily designated due to the presence of two habitats listed on Annex 1 of the Habitats Directive: annual vegetation of drift lines and European dry heath. A further Annex 1 habitat, perennial vegetation of dry stony banks, is present but was not a primary reason for site selection. Other habitats within the SAC include coastal sand dunes, beaches, shingle, marshes, fen, heath, scrub and mixed woodland. The full citation is contained in **Appendix C** of this report.

Nationally Designated Sites

Sizewell Marshes SSSI, which covers an area of 104 hectares, lies entirely within the Sizewell Estate, and is located ~30m from the edge of the development (nearest to the car park extension). It was designated on the basis of the large area of lowland unimproved wet meadow it contains. Associated with the wet meadows are outstanding assemblages of invertebrates and breeding birds and several nationally scarce plant species. The SSSI is on an area of deep fen peat with a permanently high water table. There is an extensive ditch system and the area is prone to flooding. The SSSI citation is included in **Appendix D** of this report.

Other SSSIs within 2km of the site are Minsmere to Walberswick Heaths and Marshes SSSI and Leiston to Aldeburgh SSSI. Minsmere to Walberswick Heaths and Marshes SSSI (parts of which have been classified as SPA and designated as an SAC) is approximately 200m to the north of the proposed new build power station (and adjacent to the proposed new access road at its closest point). The SSSI covers over 2,325 hectares and is managed by a variety of conservation organisations including Natural England, RSPB, SWT and The National Trust. The SSSI contains a complex series of habitats, notably mudflats, shingle beach, reedbeds, heathland and grazing marsh, which combine to create an area of exceptional scientific interest.

Leiston to Aldeburgh SSSI, part of which is also designated as the Sandlings SPA, is approximately 1,750m to the south and south-west of the proposed new build at its nearest point. The SSSI contains a rich mosaic of habitats including acid grassland, heath, scrub, woodland, fen, open water and vegetated shingle. This mix of habitats in close juxtaposition, together with the associated transition communities between habitats, is unusual in the Suffolk Coast and Heaths Natural Area. The variety of habitats present support a diverse breeding and overwintering bird community, a high number of dragonfly species and many scarce plants.

The citations for both Leiston to Aldeburgh SSSI and Minsmere to Walberswick Heaths and Marshes SSSI are contained in **Appendix D** of this report.

2.2.2 Non-statutory Designated Sites

Severn non-statutory designated sites are present within 2km of the proposed development sites (illustrated in **Figure 2.2**). These include areas adjoining statutory designations which, while valued, do not meet the criteria for SAC, SPA or SSSI status and in this case are termed Wildlife Sites and Suffolk Wildlife Trust (SWT) Reserves. Those of most relevance to the assessment are Sizewell Levels and Associated Areas Wildlife Site and Wildlife Trust Reserve; Suffolk Shingle Beaches Wildlife Site and Sizewell Rigs Wildlife Site.

Sizewell Levels and Associated Areas Wildlife Site is adjacent to the Sizewell Marshes SSSI and covers wet meadows, scrub and birch / alder woodland in this area. Some of the Wildlife Site, and all of the Sizewell Marshes SSSI, are part of a SWT Reserve. Suffolk Shingle Beaches Wildlife Site is a designation that covers all areas of shingle not currently protected under national or European designations. A kittiwake colony of approximately 200 occupied nests is present at Sizewell Rigs, the cooling water structure offshore from Sizewell 'A'.

Locally designated sites of nature conservation interest (such as Wildlife Sites) are recognised by the Local Planning Authority as a material planning consideration under Policy AP15 of the Suffolk Coast Local Plan. Under Policy AP14, where a development may result in the loss, or significant alteration of important habitats¹, or pose a threat to rare or vulnerable species (especially those protected by law) or a threat to species or habitats identified in National or Local Biodiversity Action Plans, the replacement or retention of important wildlife habitats will be sought through conditions or legal agreement.

2.2.3 Ornithology

A large amount of detailed ornithological information has been collected from the area surrounding the existing Power Stations e.g. from SWT winter bird surveys, incidental records and from intensive and detailed bird surveys by Entec currently on-going within the BE estate in relation to the new nuclear power station proposals. These surveys have indicated that the areas of greatest ornithological interest are within the Marshes and along the coastal zone, which support both species and aggregations of species that are considered to be of nature conservation importance.

Given the small size and location of the proposed development areas (i.e. away from the coast and marshes and within the built Power Station security fence), it is considered unlikely these areas would support a significant bird community or be used extensively by species present in the marshes or along the coast. However, habitat does exist that could be used for nesting and foraging by common species.

¹ These are considered to include heathland, woodland, dunes, water meadows, streams, ponds, reedbeds, green lanes, trees and hedges.

2.2.4 Habitats and Vegetation

An Extended Phase 1 Habitat survey of the development areas was completed on the 8th September 2008, with the aim of informing the proposed scope of the assessment. The results of the survey are illustrated in **Figure 2.3a and b** and summarised below.

The site of the proposed car park extension comprises a large, open area of poor semi-improved grassland, that has either regenerated or been re-seeded following the construction of the Power Station and which has remnant, scattered calcareous species around the edges. This area is bordered to the west and south by dense and scattered scrub and scattered trees and to the east by planted non-native shrubs. Tall ruderal plants also occur throughout the site, there are scattered log piles in the western area and an area of hard-standing is present to the north of the site. The eastern part of the grassland and herb sward is short and disturbed by fairly extensive grazing by rabbits and trampling. The western side is less disturbed and damper with a more complex sward structure. A wooded valley occurs to the west of the site, with the main Sizewell 'B' Power Station (and associated hard-standing) to the east.

Although the grassland area supports a number of species, at low densities, suggestive of calcareous or coastal habitats, the predominant species are more indicative of improvement and are commonly found throughout Suffolk and the UK.

The site of the new ISFSI is primarily an existing car park and therefore comprises predominantly hard-standing. The current site boundary overlaps with a small electricity substation building which is surrounded by gravel and hard-standing. Adjacent to this part of the proposed development area are further areas of hard-standing, amenity grassland and a small strip of introduced shrub (located to the west).

2.2.5 Protected and Notable Species

Badger

Existing baseline information indicates badgers are present in the surrounding area, with a known sett located in woodland on the wider BE estate. The western part of the development site (the proposed new car park) and surrounding habitats provide suitable habitat for badger, but no evidence of this species was found.

Great crested newt

There are no discrete pools within the site, but the extensive ditch system associated with the Sizewell Marshes lies adjacent to the site and this area has some potential to support great crested newts. The ditches were not systematically surveyed for newts as part of the EIA for the decommissioning work for Sizewell 'A' and there has been no historical survey or sampling programme commissioned by BE. The indications are that due to a combination of factors (predominantly the presence of fish, the year round presence of water birds, the variable rate of flow and the salinity of some of the dykes) the ditches are sub-optimal for newts. However, a systematic survey for great crested newts across the BE estate was undertaken in relation to the new build development proposals in 2007. This resulted in no great crested newts being recorded and therefore it is reasonable to conclude this species does not occur in the vicinity of the development site and will not be considered further.

Bats

Work undertaken on the Sizewell Estate by the Suffolk Bat Group has found that common and soprano pipistrelle, Natterer's bat and barbastelle are among the species that occur locally. Noctule and Daubenton's bat were recorded during surveys undertaken by Bioscan in 1991, and brown long-eared bat was also recorded by Cresswell Associates in association with the decommissioning EIA for Sizewell 'A' in 2005. Leisler's and serotine bats were also recorded during the surveys undertaken by Entec in 2007 for the potential new build development.

The building within the boundary of the new ISFSI site provides the only potentially suitable roosting location for bats within the development areas, as there are no other buildings or mature trees present. The substation building is flat roofed and well built, so there are few gaps a bat could use to enter or exit the building. However, potential entry/exit points (which appear to be for ventilation) do exist above the building doors. Overall the building is considered to have low potential to support a roost.

In addition, there is potential for the proposed development areas to be used infrequently by foraging bats (particularly the western proposed car park area which is currently grassland), but they are unlikely to be used extensively given their small size.

Otter and water vole

Sizewell Marshes is regarded as a key site for water vole in Suffolk. Surveys have been undertaken of the Sizewell Belts as part of the UK Key Sites Project since 2001, with twelve transects (located throughout the Sizewell Marshes) monitored by Royal Holloway University (RHU) on an annual basis. Water vole was confirmed as present on all but one of the water courses sampled during a survey undertaken by Entec 2007 (in relation to the proposed new nuclear build).

Otter signs are regularly found around watercourses throughout the estate and there have also been occasional sightings of family groups, suggesting that the species may breed in the Sizewell Belts. Otter was confirmed as present on four out of 20 ditches surveyed by Entec 2007 (in relation to the proposed new nuclear build).

There is no potential for water vole or otter to occur within the proposed development area, as watercourses are absent. The nearest watercourse is located approximately 40 to the west of the proposed car park extension site. However, the development is considered to be sufficient distance from this watercourse to prevent any potentially significant effects on water vole and otter and these species are not considered further.

Reptiles

Surveys of Leiston Common and Goose Hills (commissioned by BE) and records held by Suffolk Biological Records Centre suggest that adder (a Suffolk BAP species), grass-snake and slow-worm are widespread within the estate. A reptile survey undertaken by Entec in 2007 (in relation to the new nuclear build proposals) found that all four common reptile species were recorded within the survey areas (which are located to the north of the existing Power Station) with exceptional populations of adders and slow worms, a good population of common lizard and a low population of grass snake present.

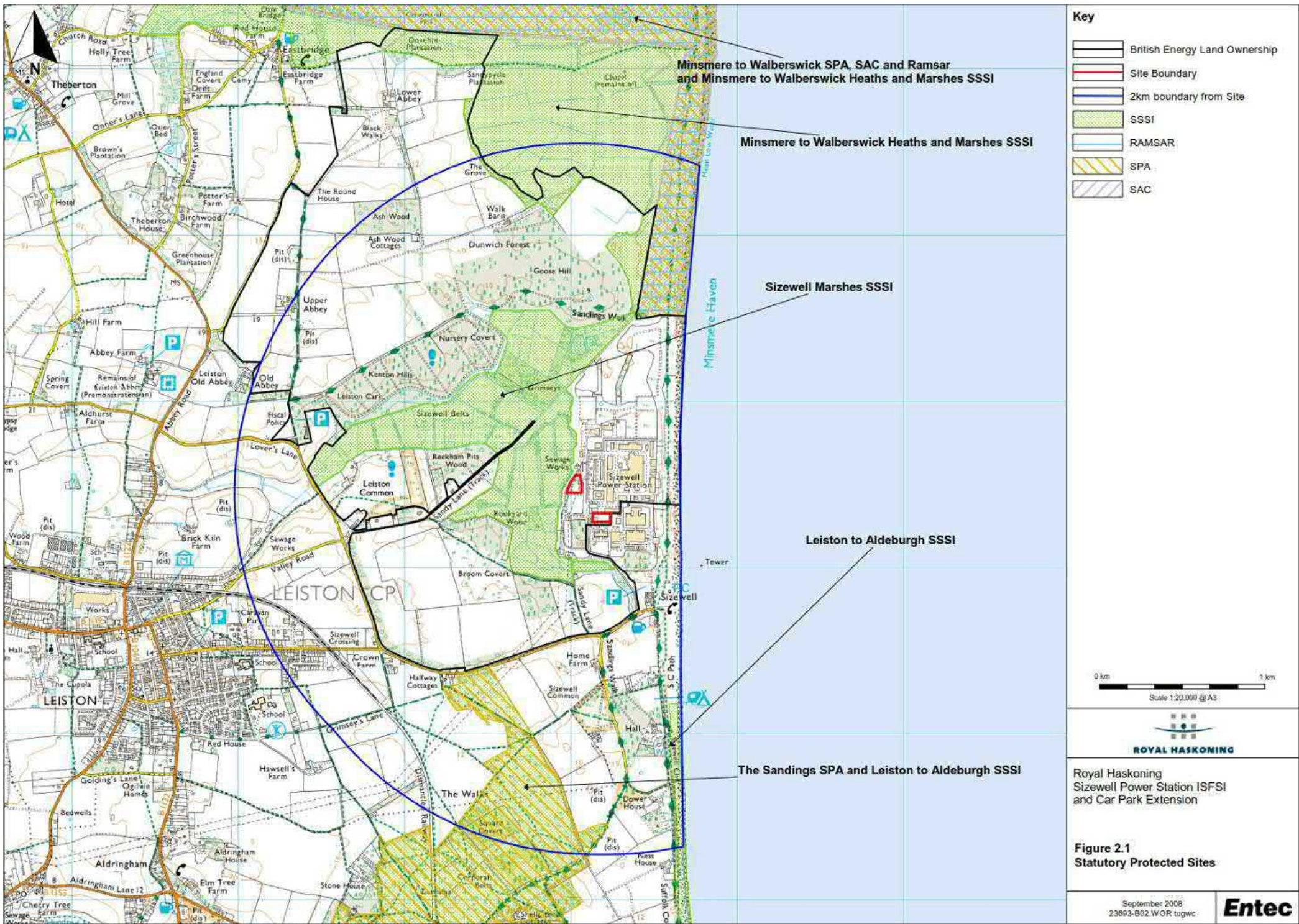
The western development area at the site (the car park extension area) and the surrounding habitats are considered to provide suitable habitat for reptiles and common lizard were observed during the Extended Phase 1 Habitat survey.

Invertebrates

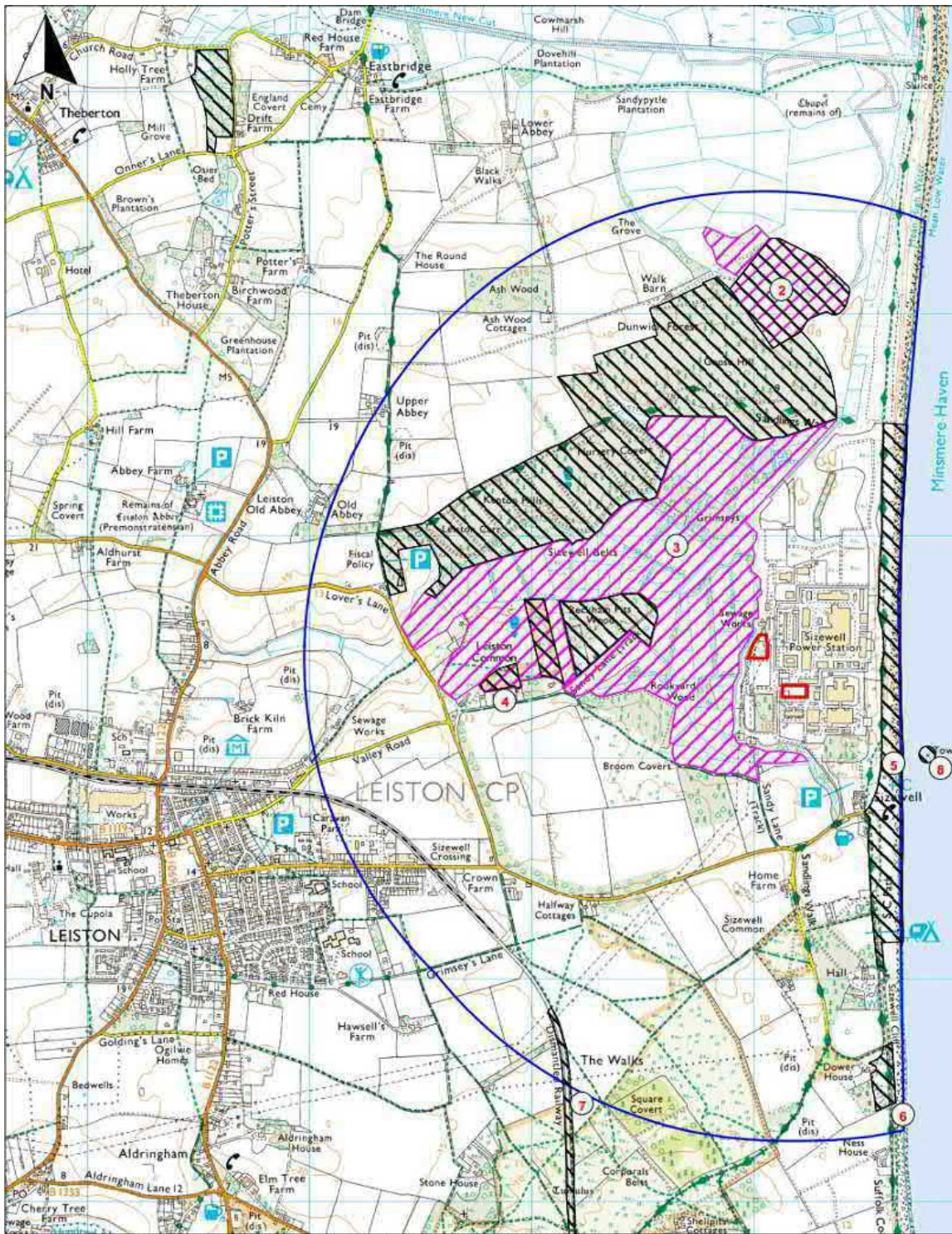
The description for Sizewell Marshes SSSI (located to the west of the development area) states that the site is of exceptional interest for its invertebrate fauna and that it supports a wide range of taxa, including many nationally rare or scarce species. Invertebrate taxa have not been 'systematically' surveyed within the BE Estate, with the last focussed invertebrate work undertaken by Bioscan in 1991, which concentrated on aquatic and terrestrial invertebrates present in the Sizewell Marshes SSSI. Additionally SWT undertake annual butterfly transects (since 2004), monitor the numbers of larval pits dug by ant lions (a Suffolk BAP species) at Walk Barns and conduct occasional moth trapping in conjunction with the Suffolk Moth Group.

The results of the invertebrate surveys undertaken by Entec in 2007 (in relation to the potential new build proposals) indicated that the areas to the north of the existing Power Station that had been reinstated were of some limited value for invertebrates, but that the semi-natural habitats along the coast and within the grazing marsh support a more species-rich assemblage.

It is therefore likely that the western proposed development area would be comparable to those areas surveyed previously and would support a comparatively limited range of invertebrate species.



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- Key**
- Site Boundary
 - 2km boundary from Site
 - County Wildlife Trust
 - Suffolk Wildlife Trust
 - 2 Sites
1. Minsmere Valley
 2. Southern Minsmere Levels
 3. Sizewell Levels and associated areas
 4. Leiston Common
 5. Suffolk shingle beaches
 6. Dower House
 7. Disused railway line (Aldringham-Aldeburgh)
 8. Sizewell Rigs

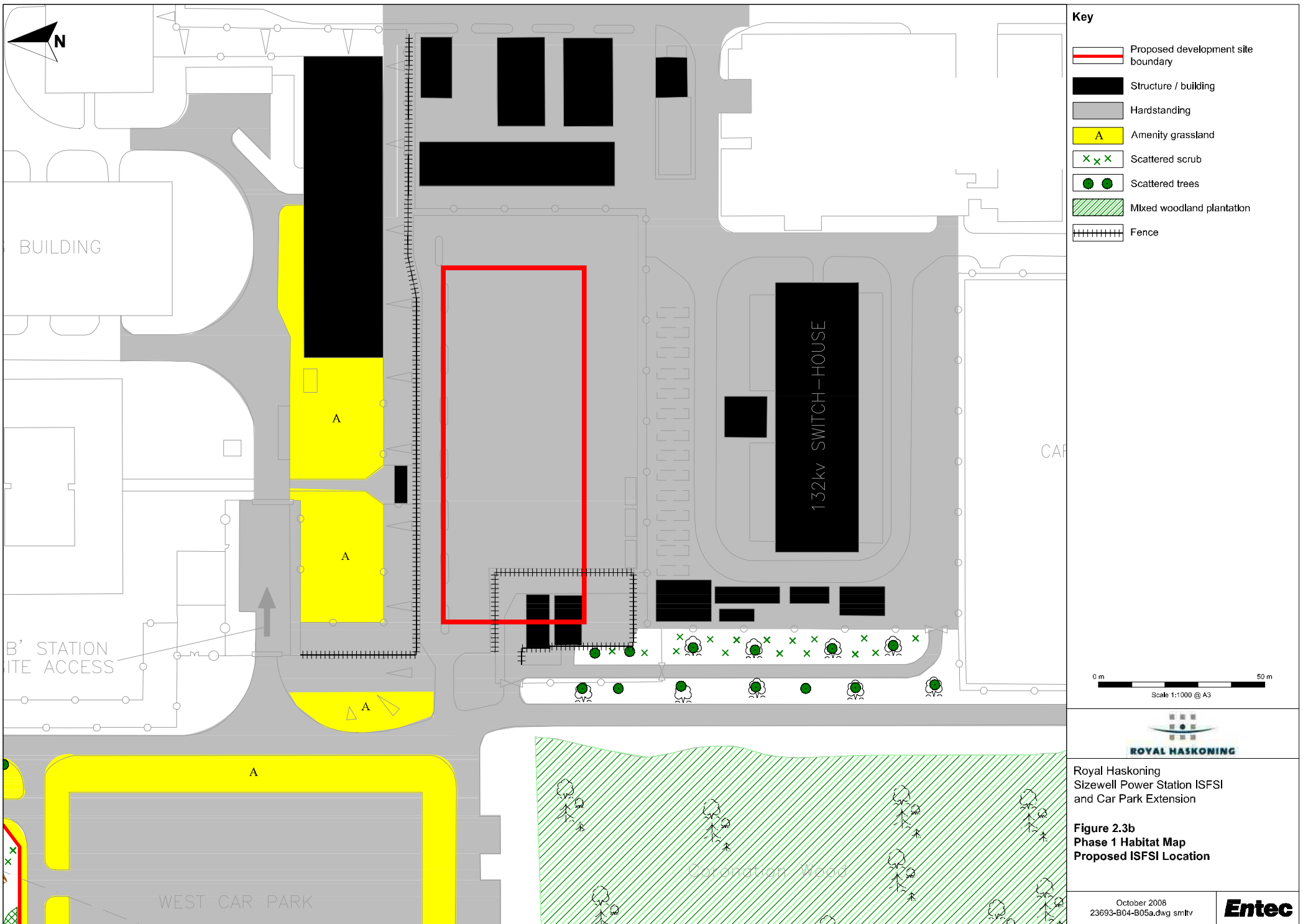


Royal Haskoning
Sizewell Power Station ISFSI
and Car Park Extension

Figure 2.2
Non-statutory Designated Sites

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3. Proposed Scope of the Assessment

The existing baseline information summarised above has been used to determine the scope of the ecological and ornithological assessment for the proposed development, insofar as it can be determined at this stage of EIA process. The proposed scope is detailed in Table 3.1. Within the table it is also highlighted where further survey work is considered necessary.

Table 1.1 Summary of Proposed Scope of Assessment

Receptor	Changes and potential effects	Could the change be significant and why?	Next steps in the EIA process
Construction and permanent land use change			
Internationally designated sites (Ramsar, SPA and SAC)	<p>Increased noise levels affecting components, especially birds, of the Ramsar and SPA.</p> <p>Increased dust deposition affecting growth/survival of plants.</p> <p>Decrease in water quality from polluted site run-off affecting designated features</p>	<p>No</p> <p>The development is considered to be located at a sufficient distance from the internationally designated sites to prevent significant affects.</p>	<p>None</p>
Nationally designated sites (SSSI)	<p>Increased noise levels affecting reasons for designation (e.g. birds).</p> <p>Increased dust deposition affecting growth/survival of plants.</p> <p>Decrease in water quality from polluted site run-off affecting designated features.</p>	<p>Yes</p> <p>The Sizewell Marshes SSSI is located ~30m from the western development area.</p>	<p>Assessment within the EIA of affects on receptor.</p> <p>Consultation with Natural England.</p> <p>Implementation of environmental management measures during construction to minimise noise, dust and run-off potential.</p>
Non - statutory designated sites (e.g. LWS)	<p>Increased noise levels affecting components of LWS.</p> <p>Increased dust deposition affecting growth/survival of plants.</p> <p>Decrease in water quality from polluted site run-off.</p>	<p>Yes</p> <p>Sizewell Levels and Associated Areas Wildlife Site lies ~30m from the western development area.</p>	<p>Assessment within the EIA of affects on receptor.</p> <p>Consultation with County Ecologist and SWT.</p> <p>Implementation of environmental management measures during construction to minimise noise, dust and run-off potential.</p>
Habitats	<p>Permanent loss of habitats and temporary disturbance</p>	<p>No</p> <p>The habitats recorded at the site comprise commonly found species typical of disturbed and/or re-seeded areas.</p>	<p>Investigation into potential to manage adjacent habitat (currently dense scrub) to create further areas of comparable grassland.</p>

Receptor	Changes and potential effects	Could the change be significant and why?	Next steps in the EIA process
Birds	Permanent loss of habitat. Destruction of birds nests during breeding season	No It is considered unlikely the development areas would be used extensively by birds, including those part of the SPA and SSSI designation. However, there is likely to be some loss of potential nesting habitat (which is plentiful in the surrounding area) and therefore there is a requirement to comply with the legislation that relates to this species group.	Commitment in ES to clear vegetation outside breeding bird season (March to August inclusive) or to be supervised by an ecologist.
Badger	Permanent loss of foraging habitat. Disturbance or destruction of setts	No There are no setts currently within the proposed development site or adjacent to it and no evidence of badger usage for foraging has been found. However, the site has the potential to support badger and may become more extensively used before construction. Therefore, there is a requirement to comply with the legislation that relates to this species	Commitment in ES to re-survey of the site prior to construction to determine whether any new setts have been constructed.
Bats	Disturbance and/or destruction of a roost Loss of foraging habitat	Unknown Given the small size of the potential foraging habitat affected and the extensive alternative areas available in the wider landscape it is considered unlikely a significant effect would occur on foraging bats. The status of bats within the substation building is currently unknown.	If the substation building will be affected by the works, an internal inspection of the building to assess its potential to support bats is recommended, with the potential requirement for emergent surveys if significant potential is found. Consultation with Natural England may also be required.
Reptiles	Death / injury of reptiles. Loss of foraging / hibernating habitat.	Yes The habitat within and adjacent to the western development area is suitable for reptiles, but the species composition and population status of any reptiles present is currently unknown. There is also a requirement to comply with the legislation that relates to reptiles.	Reptile survey of the suitable habitats within and adjacent to the site, comprising a minimum of 12 survey visits and following recognised methodology (Froglife Advice Sheet 10 – Reptile Survey, 1999). Assessment within the EIA of affects on receptor. Consultation with Natural England.
Invertebrates	Permanent loss of habitat affect BAP or notable species	No The habitat within the site is considered to be of some limited value to invertebrates comparable to previous survey work, but unlikely to significantly affect any BAP or notable species	Investigation into potential to manage adjacent habitat (currently dense scrub) to create further areas of comparable grassland, which could be utilised by displaced invertebrates.

Receptor	Changes and potential effects	Could the change be significant and why?	Next steps in the EIA process
New infrastructure and operation			
Designated sites	Increased disturbance from noise affecting components, especially birds, of the Ramsar and SPA. Changes in water quality from site run-off affecting designated features.	No The proposed development areas are located within the existing Power Station compound and therefore are unlikely to add significantly to the current noise level when in use. The proposed new car park will be located adjacent to an existing car park.	None

4. Summary

In summary, a review of the existing baseline information and data collected during the site visit has resulted in a scope that will encompass the following elements:

- designated sites (both national and local);
- reptiles; and
- roosting bats.

The remaining habitats and species that occur at the site, or had potential to occur based on the desk study information, (e.g. introduced shrub, water vole and invertebrates), have been scoped out of the EIA assessment.

The following legally protected species, which have the potential to occur at the proposed development site, will also be considered within the EIA:

- breeding birds (non-SPA); and
- badgers.

Appendix A

Minsmere to Walberswick Ramsar Citation

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7, as amended by Resolution VIII.13 of the Conference of the Contracting Parties.

Note for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers are strongly urged to provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of maps.

1. Name and address of the compiler of this form:**Joint Nature Conservation Committee**

Monkstone House

City Road

Peterborough

Cambridgeshire PE1 1JY

UK

Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948

Email: RIS@JNCC.gov.uk

FOR OFFICE USE ONLY.

DD MM YY

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Designation date

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Site Reference Number

2. Date this sheet was completed/updated:

Designated: 05 January 1976

3. Country:

UK (England)

4. Name of the Ramsar site:

Minsmere–Walberswick

5. Map of site included:Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps.**a) hard copy** (required for inclusion of site in the Ramsar List): yes ✓ -or- no**b) digital (electronic) format** (optional): Yes

6. Geographical coordinates (latitude/longitude):

52 18 55 N

01 38 02 E

7. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Southwold

Composite site situated on the coast of Suffolk, between Southwold in the north and Sizewell in the south.

Administrative region: Suffolk

8. Elevation (average and/or max. & min.) (metres): **9. Area** (hectares): 2018.92

Min. -1

Max. 24

Mean 9

10. Overview:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

This composite, Suffolk coastal site contains a complex mosaic of habitats, notably, areas of marsh with dykes, extensive reedbeds, mudflats, lagoons, shingle and driftline, woodland and areas of lowland heath. The site supports the largest continuous stand of reed in England and Wales and demonstrates the nationally rare transition in grazing marsh ditch plants from brackish to fresh water. The combination of habitats create an exceptional area of scientific interest supporting nationally scarce plants, British Red Data Book invertebrates and nationally important numbers of breeding and wintering birds.

11. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

1, 2

12. Justification for the application of each Criterion listed in 11. above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 1

The site contains a mosaic of marine, freshwater, marshland and associated habitats, complete with transition areas in between. Contains the largest continuous stand of reedbeds in England and Wales and rare transition in grazing marsh ditch plants from brackish to fresh water.

Ramsar criterion 2

This site supports nine nationally scarce plants and at least 26 red data book invertebrates.

Supports a population of the mollusc *Vertigo angustior* (Habitats Directive Annex II; British Red Data Book Endangered), recently discovered on the Blyth estuary river walls.

An important assemblage of rare breeding birds associated with marshland and reedbeds including: *Botaurus stellaris*, *Anas strepera*, *Anas crecca*, *Anas clypeata*, *Circus aeruginosus*, *Recurvirostra avosetta*, *Panurus biarmicus*

13. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

14. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	acidic, neutral, shingle, sand, peat, nutrient-poor, mud, alluvium
Geomorphology and landscape	lowland, coastal, valley, floodplain, shingle bar, intertidal sediments (including sandflat/mudflat), open coast (including bay), estuary, lagoon
Nutrient status	mesotrophic
pH	circumneutral
Salinity	brackish / mixosaline, fresh, saline / euhaline
Soil	no information
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Lowestoft, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/lowestoft.html) Max. daily temperature: 13.0° C Min. daily temperature: 7.0° C Days of air frost: 27.8 Rainfall: 576.3 mm Hrs. of sunshine: 1535.5

General description of the Physical Features:

Minsmere – Walberswick comprises two large marshes, the tidal Blyth estuary and associated habitats. This composite coastal site contains a complex mosaic of habitats, notably areas of marsh with dykes, extensive reedbeds, mudflats, lagoons, shingle, woodland and areas of lowland heath. It supports the largest continuous stand of common reed *Phragmites australis* in England and Wales, and demonstrates the nationally rare transition in grazing marsh ditch plants from brackish to fresh water.

15. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

Minsmere – Walberswick comprises two large marshes, the tidal Blyth estuary and associated habitats. This composite coastal site contains a complex mosaic of habitats, notably areas of marsh with dykes, extensive reedbeds, mudflats, lagoons, shingle, woodland and areas of lowland heath.

16. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

No special values known

17. Wetland types

Marine/coastal wetland

Code	Name	% Area
E	Sand / shingle shores (including dune systems)	12.4
F	Estuarine waters	2.5
G	Tidal flats	12.9
H	Salt marshes	7.2
J	Coastal brackish / saline lagoons	1
M	Rivers / streams / creeks: permanent	4
U	Peatlands (including peat bogs swamps, fens)	30
Other	Other	30

18. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site.

This composite Suffolk coastal site contains a complex mosaic of habitats notably, areas of marsh with dykes, extensive reedbeds, mud flats, lagoons, shingle, woodland and areas of lowland heath. The site supports the largest continuous stand of reed *Phragmites australis* in England and Wales and nationally rare transition in grazing marsh ditch plants from brackish to fresh water. The combination of habitats create an exceptional area of scientific interest supporting nationally scarce plants, RDB invertebrates and nationally important numbers of breeding and wintering birds.

19. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Nationally important species occurring on the site.**Higher Plants.**

This is one of few sites nationally for red-tipped cudweed *Filago lutescens* (RDB2) which occurs on light, sandy soils.

The nationally rare species *Corynephorus canescens* (RDB3) occurs on coastal dune habitat.

The site supports a range of nationally scarce plant species characteristic of heathland, wetland and coastal habitats, and the transitions between them. *Althaea officinalis*, *Myriophyllum verticillatum*, *Ruppia cirrhosa*, *Sium latifolium*, *Sonchus palustris*, *Ceratophyllum submersum*, *Ranunculus baudotii*, and *Carex divisa* (all nationally scarce) are associated with reedbeds, grazing marsh or ditches. *Hordeum marinum* occurs on sea-walls, *Lathyrus japonicus* on coastal shingle, and *Crassula tillaea* on heathland.

20. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 12. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Species currently occurring at levels of national importance:**Species regularly supported during the breeding season:**

Eurasian marsh harrier , <i>Circus aeruginosus</i> , Europe	16 pairs, representing an average of 10.5% of the GB population (5 year mean 1993-1997)
Mediterranean gull , <i>Larus melanocephalus</i> , Europe	2 apparently occupied nests, representing an average of 1.8% of the GB population (Seabird 2000 Census)
Black-headed gull , <i>Larus ridibundus</i> , N & C Europe	2558 apparently occupied nests, representing an average of 1.9% of the GB population (Seabird 2000 Census)
Little tern , <i>Sterna albifrons albifrons</i> , W Europe	20 apparently occupied nests, representing an average of 1% of the GB population (Seabird 2000 Census)

Species with peak counts in spring/autumn:

Great bittern , <i>Botaurus stellaris stellaris</i> , W Europe, NW Africa	3 individuals, representing an average of 3% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Eurasian teal , <i>Anas crecca</i> , NW Europe	3083 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)

Ruff , <i>Philomachus pugnax</i> , Europe/W Africa	10 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9-2002/3)
Black-tailed godwit , <i>Limosa limosa islandica</i> , Iceland/W Europe	846 individuals, representing an average of 5.4% of the GB population (5 year peak mean 1998/9-2002/3 - spring peak)
Spotted redshank , <i>Tringa erythropus</i> , Europe/W Africa	15 individuals, representing an average of 11% of the GB population (5 year peak mean 1998/9-2002/3)
Common greenshank , <i>Tringa nebularia</i> , Europe/W Africa	9 individuals, representing an average of 1.5% of the GB population (5 year peak mean 1998/9-2002/3)
Species with peak counts in winter:	
Greater white-fronted goose , <i>Anser albifrons albifrons</i> , NW Europe	212 individuals, representing an average of 3.6% of the GB population (5 year peak mean for 1996/7-2000/01)
Gadwall , <i>Anas strepera strepera</i> , NW Europe	261 individuals, representing an average of 1.5% of the GB population (5 year peak mean 1998/9-2002/3)
Northern shoveler , <i>Anas clypeata</i> , NW & C Europe	238 individuals, representing an average of 1.6% of the GB population (5 year peak mean 1998/9-2002/3)
Hen harrier, <i>Circus cyaneus</i> , Europe	15 individuals, representing an average of 2% of the GB population (5 year peak mean 1985/6-1989/90)
Water rail , <i>Rallus aquaticus</i> , Europe	5 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Pied avocet , <i>Recurvirostra avosetta</i> , Europe/Northwest Africa	329 individuals, representing an average of 9.6% of the GB population (5 year peak mean 1998/9-2002/3)
European golden plover , <i>Pluvialis apricaria apricaria</i> , P. a. altifrons Iceland & Faroes/E Atlantic	4503 individuals, representing an average of 1.8% of the GB population (5 year peak mean 1998/9-2002/3)
Common redshank , <i>Tringa totanus totanus</i> ,	1386 individuals, representing an average of 1.1% of the GB population (5 year peak mean 1998/9-2002/3)
Lesser black-backed gull , <i>Larus fuscus graellsii</i> ,	905 individuals, representing an average of 1.4% of the GB population (5 year peak mean 1998/9-2002/3)

Species Information

Nationally important species occurring on the site.

Invertebrates.

Ethmia bipunctella, *Aleochara inconspicua*, *Philonthus dimidiatipennis*, *Deltote bankiana*, *Cephalops perspicuus*, *Erioptera bivittata*, *E. mejerei*, *Gymnancycla canella*, *Pisidium pseudosphaerium*, *Archanara neurica*, *Heliothis viriplaca*, *Pelosia muscerda*, *Photedes brevilinea*, *Senta flammea*, *Herminea tarsicrinalis*, *Haematopota grandis*, *Tipula marginata*, *Podalonia affinis*, *Arctosa fulvolineata*, *Eucosma catroptana*, *E.maritima*, *Melissoblaptres zelleri*, *Pima boisduvaliella*, *Acrotophthalmus bicolor*, *Limonia danica*, *Telmaturus tumidulus*, *Vertigo angustior* (a Habitats Directive Annex II species (S1014)).

21. Social and cultural values:

e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc.
Distinguish between historical/archaeological/religious significance and current socio-economic values.

- Aesthetic
- Aquatic vegetation (e.g. reeds, willows, seaweed)
- Environmental education/ interpretation
- Livestock grazing
- Non-consumptive recreation
- Scientific research
- Tourism

22. Land tenure/ownership:

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	+
Local authority, municipality etc.	+	
National/Crown Estate	+	
Private	+	+
Other	+	

23. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	
Cutting of vegetation (small-scale/subsistence)	+	
Permanent arable agriculture		+
Grazing (unspecified)	+	
Flood control	+	
Transport route	+	+
Non-urbanised settlements	+	+

24. Factors adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.
2. Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
Erosion	2	Coastal squeeze within the Blyth Estuary	+		+

Recreational/tourism disturbance (unspecified)	2	Trampling damage to vegetated shingle and driftline communities, and disturbance of little tern nesting habitat	+		+

For category 2 factors only.

What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Erosion - English Nature provides advice to the Environment Agency and coastal local authorities in relation to flood and coastal protection management. This will inform the development of the Suffolk Estuaries strategies and the second generation shoreline management plan.

Recreational/tourism disturbance (unspecified) - English Nature to work with owners/occupiers and regulatory authorities to develop a strategy to manage visitor pressure on Suffolk vegetated shingle. These measures are likely to include temporary fencing and provision of boardwalks as well as measures to increase visitor awareness about the sensitivity of the shingle habitat, for example by interpretation, wardening.

Is the site subject to adverse ecological change? YES

25. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	
National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	
Management agreement	+	
Site management statement/plan implemented	+	
Area of Outstanding National Beauty (AONB)	+	+
Environmentally Sensitive Area (ESA)	+	+
Special Area of Conservation (SAC)	+	

26. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

27. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Fauna.

Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.

Flora.

NVC and vegetation monitoring, bird and invertebrate surveys/monitoring carried out on EN's NNRs, NT, SWT, RSPB reserves.

28. Current conservation education:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.
Facilities at National Trust and Royal Society for the Protection of Birds reserves.

29. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities, Facilities provided and Seasonality.

A popular area for tourists as it is an AONB and contains Minsmere bird reserve and Dunwich heath, both with toilets/shop/cafe. There are more visitors in the summer, however it well used throughout the year by walkers and bird watchers.

30. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs,
European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay,
Bristol, BS1 6EB

31. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House,
Northminster Road, Peterborough, PE1 1UA, UK

32. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 13 above), list full reference citation for the scheme.

Site-relevant references

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Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
Telephone: +41 22 999 0170 • Fax: +41 22 999 0169 • email: ramsar@ramsar.org

Appendix B

Minsmere to Walberswick SPA Citation

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type 1.2 Site code

1.3 Compilation date 1.4 Update

1.5 Relationship with other Natura 2000 sites

1.6 Respondent(s)

1.7 Site name

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	199205
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
01 38 02 E	52 18 55 N

2.2 Site area (ha) 2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK403	Suffolk	100.00%

2.6 Biogeographic region

Alpine

Atlantic

Boreal

Continental

Macaronesia

Mediterranean

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

Code	Species name	Population			Site assessment			
		Resident	Migratory		Population	Conservation	Isolation	Global
Breed	Winter	Stage						
A056	<i>Anas clypeata</i>		23 P		B		C	
A056	<i>Anas clypeata</i>			98 I	C		C	
A052	<i>Anas crecca</i>		73 P		B		C	
A051	<i>Anas strepera</i>			93 I	C		C	
A051	<i>Anas strepera</i>		24 P		B		C	
A041a	<i>Anser albifrons albifrons</i>			67 I	C		B	
A021	<i>Botaurus stellaris</i>		7 I		A		B	
A224	<i>Caprimulgus europaeus</i>		24 P		C		C	
A081	<i>Circus aeruginosus</i>		16 P		B		B	
A082	<i>Circus cyaneus</i>			15 I	C		C	
A132	<i>Recurvirostra avosetta</i>		47 P		B		B	
A195	<i>Sterna albifrons</i>		28 P		C		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	14.0
Salt marshes. Salt pastures. Salt steppes	8.0
Coastal sand dunes. Sand beaches. Machair	3.0
Shingle. Sea cliffs. Islets	3.0
Inland water bodies (standing water, running water)	4.0
Bogs. Marshes. Water fringed vegetation. Fens	15.0
Heath. Scrub. Maquis and garrigue. Phygrana	23.0
Dry grassland. Steppes	
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	7.0
Other arable land	2.0
Broad-leaved deciduous woodland	16.0
Coniferous woodland	5.0
Evergreen woodland	
Mixed woodland	
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Screes. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	
Total habitat cover	100%

4.1 Other site characteristics

Soil & geology:

Acidic, Mud, Nutrient-poor, Peat, Sand, Shingle

Geomorphology & landscape:

Coastal, Estuary, Floodplain, Intertidal sediments (including sandflat/mudflat), Lagoon, Lowland, Open coast (including bay), Shingle bar

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)

During the breeding season the area regularly supports:

<i>Botaurus stellaris</i> (Europe - breeding)	35% of the GB breeding population 5 year mean, 1993-1997
<i>Caprimulgus europaeus</i>	0.7% of the GB breeding population Count, as at 1990
<i>Circus aeruginosus</i>	10.2% of the GB breeding population 5 year mean, 1993-1997
<i>Recurvirostra avosetta</i> (Western Europe/Western Mediterranean - breeding)	10.4% of the GB breeding population Count, as at early 1990s
<i>Sterna albifrons</i> (Eastern Atlantic - breeding)	1.2% of the GB breeding population 5 year mean, 1992-1996
Over winter the area regularly supports:	
<i>Circus cyaneus</i>	2% of the GB population 5 year peak mean, 1985/6-1989/90

ARTICLE 4.2 QUALIFICATION (79/409/EEC)**During the breeding season the area regularly supports:**

<i>Anas clypeata</i> (North-western/Central Europe)	2.3% of the population in Great Britain Count, as at 1990
<i>Anas crecca</i> (North-western Europe)	4.9% of the population in Great Britain Count, as at 1990
<i>Anas strepera</i> (North-western Europe)	3.1% of the population in Great Britain Count, as at 1990

Over winter the area regularly supports:

<i>Anas clypeata</i> (North-western/Central Europe)	1% of the population in Great Britain 5 year peak mean 1991/92-1995/96
<i>Anas strepera</i> (North-western Europe)	1.1% of the population in Great Britain 5 year peak mean 1991/92-1995/96
<i>Anser albifrons albifrons</i> (North-western Siberia/North-eastern & North- western Europe)	1.1% of the population in Great Britain 5 year peak mean 1991/92-1995/96

4.3 Vulnerability

The site is actively managed to prevent scrub and tree invasion of the heathlands grazing marshes and reedbeds. Much of the land is managed by conservation organisations and positively by private landowners through ESA and Countryside Stewardship schemes. The coastline is going to be pushed back by natural processes, this is being addressed in the Shoreline Management Plan. Alternative sites for reed bed creation are being sought to help off set the possible future natural losses.

5. Site protection status and relation with CORINE biotopes:**5.1 Designation types at national and regional level**

Code	% cover
UK01 (NNR)	27.6

NATURA 2000

STANDARD DATA FORM

FOR SPECIAL PROTECTION AREAS (SPA)
FOR SITES ELIGIBLE FOR IDENTIFICATION AS SITES OF COMMUNITY IMPORTANCE (SCI)
AND
FOR SPECIAL AREAS OF CONSERVATION (SAC)

1. Site identification:

1.1 Type 1.2 Site code

1.3 Compilation date 1.4 Update

1.5 Relationship with other Natura 2000 sites

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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1.6 Respondent(s)

1.7 Site name

1.8 Site indication and designation classification dates

date site proposed as eligible as SCI	
date confirmed as SCI	
date site classified as SPA	200108
date site designated as SAC	

2. Site location:

2.1 Site centre location

longitude	latitude
01 26 33 E	52 04 44 N

2.2 Site area (ha) 2.3 Site length (km)

2.5 Administrative region

NUTS code	Region name	% cover
UK403	Suffolk	100.00%

2.6 Biogeographic region

Alpine
 Atlantic
 Boreal
 Continental
 Macaronesia
 Mediterranean

3. Ecological information:

3.1 Annex I habitats

Habitat types present on the site and the site assessment for them:

Annex I habitat	% cover	Representativity	Relative surface	Conservation status	Global assessment

3.2 Annex I birds and regularly occurring migratory birds not listed on Annex I

Code	Species name	Population			Site assessment				
		Resident	Migratory		Population	Conservation	Isolation	Global	
Breed	Winter	Stage							
A224	<i>Caprimulgus europaeus</i>		109 P			B		C	
A246	<i>Lullula arborea</i>		154 P			B		C	

4. Site description:

4.1 General site character

Habitat classes	% cover
Marine areas. Sea inlets	
Tidal rivers. Estuaries. Mud flats. Sand flats. Lagoons (including saltwork basins)	
Salt marshes. Salt pastures. Salt steppes	
Coastal sand dunes. Sand beaches. Machair	
Shingle. Sea cliffs. Islets	
Inland water bodies (standing water, running water)	1.5
Bogs. Marshes. Water fringed vegetation. Fens	0.9
Heath. Scrub. Maquis and garrigue. Phygrana	14.6
Dry grassland. Steppes	11.5
Humid grassland. Mesophile grassland	
Alpine and sub-alpine grassland	
Improved grassland	0.1
Other arable land	
Broad-leaved deciduous woodland	10.6
Coniferous woodland	57.6
Evergreen woodland	
Mixed woodland	1.4
Non-forest areas cultivated with woody plants (including orchards, groves, vineyards, dehesas)	
Inland rocks. Scree. Sands. Permanent snow and ice	
Other land (including towns, villages, roads, waste places, mines, industrial sites)	1.8
Total habitat cover	100%

4.1 Other site characteristics

<p>Soil & geology:</p> <p>Geomorphology & landscape:</p>

4.2 Quality and importance

ARTICLE 4.1 QUALIFICATION (79/409/EEC)	
During the breeding season the area regularly supports:	
<i>Caprimulgus europaeus</i>	3.2% of the GB breeding population Count as at 1992
<i>Lullula arborea</i>	10.3% of the GB breeding population Count as at 1997

ARTICLE 4.2 QUALIFICATION (79/409/EEC)

4.3 Vulnerability

Sandlings SPA comprises six SSSIs. Sandlings Forest SSSI, the largest of these, is dominated by commercial forestry. Within the forest, large areas of open ground suitable for woodlark and nightjar were created by storm damage in 1987. Maintenance of open areas in the future relies on clear felling as the main silvicultural practice and the maintenance of some areas earmarked for woodlark and nightjar habitat. These objectives are included in the East Anglia Forest District Strategic Plan.

On the heathland SSSIs, lack of traditional management has resulted in the heathland being subjected to successional changes with the consequent spread of bracken, shrubs and trees. This is being addressed through habitat management work under the Countryside Stewardship Scheme and Tomorrows Heathland Heritage, and is resulting in the restoration of more typical heathland habitat favourable to both nightjar and woodlark.

Human influences on the site include the frequent presence of travellers' caravans. This is a longstanding problem, and a variety of mechanisms are utilised to keep them from the heathland; the digging of trenches and construction of earth barriers around the borders of sites is proving effective.

5. Site protection status and relation with CORINE biotopes:

5.1 Designation types at national and regional level

Code	% cover
UK04 (SSSI/ASSI)	100.0

Appendix C

Minsmere to Walberswick SAC Citation



Search for an SAC

Menu

Special Areas of Conservation (SAC)

UK SAC summary

UK SAC site list

England site list

Northern Ireland

Scotland

Wales

SAC selection

Summary

Background to site selection

Latest changes to the UK SAC list

Annex I Habitat accounts

Annex II Species accounts

Browse cSACs on a map

Notes on nomenclature

Search for a SAC

Other designations on UK SACs

cSACs in NI which adjoin cSACs in the RoI

Annex I habitats and Annex II species occurring in the UK

Abbreviations and acronyms

Acknowledgements

References

Download spatial and summary data

Download GIS data

Marine SACs

Minsmere to Walberswick Heaths and Marshes

Site details



Location of Minsmere to Walberswick Heaths and Marshes SAC/SCI/cSAC

Country	England
Unitary Authority	Suffolk
Grid Ref*	TM468682
Latitude	52 15 22 N
Longitude	01 37 02 E
SAC EU code	UK0012809
Status	Designated Special Area of Conservation (SAC)
Area (ha)	1265.52

* This is the approximate central point of the SAC. In the case of large, linear or composite sites, this may not represent the location where a feature occurs within the SAC.

General site character

Coastal sand dunes. Sand beaches. Machair (5%)
Shingle. Sea cliffs. Islets (15%)
Bogs. Marshes. Water fringed vegetation. Fens
(20%)
Heath. Scrub. Maquis and garrigue. Phygrana (40%)
Mixed woodland (20%)

[Boundary map](#) and associated biodiversity information on the NBN Gateway.

[Natura 2000 data form](#) for this site as submitted to Europe (PDF format, size 30kb).

[Interactive map](#) from MAGIC (Multi-Agency Geographic Information for the Countryside).

Annex I habitats that are a primary reason for selection of this site

1210 Annual vegetation of drift lines

This site is one of two representatives of **Annual vegetation of drift lines** on the east coast of England. It occurs on a well-developed beach strandline of mixed sand and shingle and is the best and most extensive example of this restricted geographical type. Species include those typical of sandy shores, such as sea sandwort *Honckenya peploides* and shingle plants such as sea beet *Beta vulgaris* ssp. *maritima*.

4030 European dry heaths

Lowland **European dry heaths** occupy an extensive area of this site on the east coast of England, which is at the extreme easterly range of heath development in the UK. The heathland is predominantly NVC type H8 *Calluna vulgaris* – *Ulex gallii* heath, usually more characteristic of western parts of the UK. This type is dominated by heather *Calluna vulgaris*, western gorse *Ulex gallii* and bell heather *Erica cinerea*.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site

1220 Perennial vegetation of stony banks

Annex II species that are a primary reason for selection of this site

Not applicable.

Annex II species present as a qualifying feature, but not a primary reason for site selection

Not applicable.

Many designated sites are on private land: the listing of a site in these pages does not imply any right of public access.

Appendix D

SSSI Citations

COUNTY: SUFFOLK SITE NAME: SIZEWELL MARSHES

DISTRICT: SUFFOLK COASTAL

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981 as amended

Local Planning Authority: SUFFOLK COUNTY COUNCIL, Suffolk Coastal District Council

National Grid Reference: TM 466638 Area: 104.33 (ha.) 257.80 (ac.)

Ordnance Survey Sheet 1:50,000: 156 1:10,000: TM 46 SE

Data Notified (Under 1949 Act): – Date of Last Revision: –

Date Notified (Under 1981 Act): 1987 Date of Last Revision: 1992

Other Information:

The site has been extended at the 1992 revision.

Description and Reasons for Notification:

Sizewell Marshes are important for their large area of lowland, unimproved wet meadows which support outstanding assemblages of invertebrates and breeding birds. Several nationally scarce plants are also present.

The site occupies a low-laying basin of deep fen peat. The water table is permanently high, with the area being prone to flooding, and there is an extensive network of ditches across the site.

In the areas of unimproved wet meadow the principal grass species are Sweet Vernal-grass *Anthoxanthum odoratum*, Crested Dog's-tail *Cynosurus cristatus*, Rough-stalked Meadow-grass *Poa trivialis* and Yorkshire-fog *Holcus lanatus*. There are many other typical species including Marsh Pennywort *Hydrocotyle vulgaris*, Ragged Robin *Lychnis flos-cuculi*, Large Bird's-foot-trefoil *Lotus uliginosus*, Marsh-orchids *Dactylorhiza* spp., Bogbean *Menyanthes trifoliata*, Bog Pimpernel *Anagallis tenella*, Yellow Iris *Iris pseudacorus*, sedges *Carex* spp. and rushes *Juncus* spp. The nationally scarce Marsh Dock *Rumex palustris* and Greater Water-parsnip *Sium latifolium* are also present. It is considered that these communities are representative of the *Juncus subnodulosus* – *Cirsium palustre* fen-meadow and the *J. effusus/acutiflorus* – *Galium palustre* rush-pasture, as described in the National Vegetation Classification. In addition, several areas of reedbed dominated by Common Reed *Phragmites australis* and alder carr occur.

The extensive ditch system supports a diverse aquatic flora which includes the nationally scarce Soft Hornwort *Ceratophyllum submersum*, Fen Pondweed *Potamogeton coloratus* and Whorled Water-milfoil *Myriophyllum verticillatum*. The variety of ditch depths and widths, together with their fringing vegetation provide an important contribution to the site's habitat value for invertebrates and birdlife.

Sizewell Marshes are of exceptional interest for their invertebrate fauna, supporting a wide range of taxa and many nationally rare or scarce species. These include terrestrial and aquatic beetles (Coleoptera), flies (Diptera), moths (Lepidoptera), dragonflies (Odonata) and spiders (Araneae).

The breeding bird assemblage is also of national significance with many species that are typical of wet grassland and associated habitats, including Shoveler, Gadwall, Teal, Snipe and Lapwing.

COUNTY: SUFFOLK SITE NAME: MINSMERE-WALBERSWICK
HEATHS AND MARSHES

DISTRICT: SUFFOLK COASTAL/WAVENEY

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981, as amended

Local Planning Authority: SUFFOLK COASTAL DISTRICT COUNCIL, Waveney District Council, Suffolk County Council

National Grid Reference: TM 475645 Area: 2325.89 (ha.) 5747.27 (ac.)
TM 467772

Ordnance Survey Sheet 1:50,000: 156 1:10,000: TM 46 NE-NW-SW
TM 47 NE-NW-SE-SW

Date Notified (Under 1949 Act): See below Date of Last Revision: 1972

Date Notified (Under 1981 Act): 1989 Date of Last Revision: 1993

Other Information:

This site amalgamates Minsmere Level SSSI (notified in 1954), Walberswick SSSI (notified in 1954) and Brick Kiln Walks SSSI (notified in 1972).

Much of this site has been designated a Special Protection Area under EC Directive 79/409 on the Conservation of Wild Birds, and as a Wetland of International Importance under the Ramsar Convention.

Much of the site is included within 'A nature conservation review' by Ratcliffe (1977). It is within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty.

Parts of the site are owned and/or managed as nature reserves and are listed below

Walberswick National Nature Reserve (English Nature)
Westleton Heath National Nature Reserve (English Nature)
Minsmere Reserve (Royal Society for the Protection of Birds)
Dunwich Heath (National Trust)
Norman Gwatkin Reserve (Suffolk Wildlife Trust)

Description and Reasons for Notification:

This composite site is situated on the coast of Suffolk between Southwold in the north and Sizewell in the south. It contains a complex series of habitats, notably mudflats, shingle beach, reedbeds, heathland and grazing marsh, which combine to create an area of exceptional scientific interest.

The tidal mudflats of the River Blyth estuary form sheltered feeding grounds for wildfowl and shorebirds, notably wigeon, shelduck, redshank and dunlin. Saltmarsh, dominated by sea purslane *Halimione portulacoides*, but also composed of sea

lavender *Limonium vulgare*, sea aster *Aster tripolium* and common cord-grass *Spartina anglica* fringes the southern shore of the estuary. Other saltmarsh species include glasswort *Salicornia* spp., sea rush *Juncus maritimus*, common saltmarsh grass *Puccinellia maritima* and sea couch-grass *Elymus pycnanthus*.

Shingle beach forms the coastline at Walberswick and Minsmere. This is subject to sea erosion and human disturbance but, nevertheless, it supports a variety of scarce shingle plants including sea pea *Lathyrus japonicus*, sea campion *Silene maritima* and small populations of sea kale *Crambe maritima*, grey hair-grass *Corynephorus canescens* and yellow horned-poppy *Glaucium flavum*. A narrow strip of yellow dune extends southwards at Minsmere behind which is a strip of dune grassland. A series of shallow, brackish lagoons and saltmarsh occurs behind the shingle beach between Walberswick and Dunwich.

Extensive reedbeds, consisting largely of pure stands of reed *Phragmites australis*, occur at Minsmere and Walberswick. These developed on former grazing marshes which were flooded as a war-time defence measure in 1940. Both marshes contain shallow pools of open water and are intersected by deep water channels. The reedbeds are an important habitat for birds and insects. There are large breeding populations of reed warbler and bearded tit. Other notable breeding species include marsh harrier, bittern, cetti's warbler, garganey and water rail. The marshes have a rich insect fauna; particularly moths, which includes a number of rare species: notably *Archanara neurica*, *Photedes brevilinea* and *Senta flammea*.

At Minsmere, a 20 hectare area of shallow lagoons and islands has been created for wading birds and wildfowl. This area is renowned for its breeding colony of avocets; shoveler, gadwall, teal and shelduck also breed.

Large blocks of grazing marsh are found near Eastbridge and Southwold. These marshes support a high number of species of breeding waterfowl such as snipe, redshank, gadwall, shoveler and black-tailed godwit. Dykes within the marshes contain very diverse aquatic plant communities, with brackish and freshwater types represented. Many nationally rare and scarce invertebrates such as the soldier fly *Odontomyia ornata* are found east of Eastbridge, as are a number of nationally scarce plants including sea barley *Hordeum marinum* and whorled water-milfoil *Myriophyllum verticillatum*. The marshes west of Eastbridge support a mosaic of different unimproved wetland communities including fen-meadow characterised by blunt-flowered rush *Juncus subnodulosus* and marsh thistle *Cirsium palustre*, reed beds, swamps dominated by lesser pond sedge *Carex acutiformis*, marshes dominated by meadowsweet *Filipendula ulmaria* with some angelica *Angelica sylvestris*, and alder *Alnus glutinosa* woodland.

High land at Minsmere, Westleton and Walberswick forms part of the East Suffolk Sandlings and is composed of infertile sands and gravels. This supports large areas of lowland heath, bracken, dry acidic grassland, woods and scrub.

Lowland heath, dominated by ling *Calluna vulgaris* but also containing bell heath *Erica cinerea* and cross-leaved heath *E. tetralix*, occupies a large continuous tract of about 400 ha at Minsmere, Dunwich and Westleton Heath with smaller areas at

Walberswick. This heathland provides a valuable habitat for two nationally decreasing birds, the nightjar and woodlark.

Patches of unimproved acid grassland in which red fescue *Festuca rubra* and common bent *Agrostis capillaris* predominate, occur through the site but areas dominated by wavy hair-grass *Deschampsia flexuosa*, purple moor-grass *Molinia caerulea* and sand sedge *Carex arenaria* also occur. A variety of other acid grassland plants is also present, of which heath bedstraw *Galium saxatile* and sheep's sorrel *Rumex acetosella* are common. Scarce species include bird's-foot clover *Trifolium ornithopodioides* and mossy stonecrop *Crassula tillaea* together with a small colony of red-tipped cudweed *Filago lutescens*. There are also substantial areas dominated by bracken *Pteridium aquilinum* or gorse *Ulex europaeus* and *U. gallii*.

Mature plantation woodland, chiefly of oak *Quercus robur* or Scots pine *Pinus sylvestris* but also including sycamore *Acer pseudoplatanus* and sweet chestnut *Castanea sativa*, occur at Minsmere and Walberswick. Naturally regenerated woods of birch *Betula pendula* and Scots pine have arisen on former heathland and alder *Alnus glutinosa*, sallow *Salix* spp. and birch woodlands are also present on wet ground. This woodland and scrub provides important additional habitat diversity for birds and invertebrates.

COUNTY: SUFFOLK SITE NAME: LEISTON-ALDEBURGH

DISTRICT: SUFFOLK COASTAL

Status: Site of Special Scientific Interest (SSSI) notified under Section 28 of the Wildlife and Countryside Act 1981

Local Planning Authorities: SUFFOLK COASTAL DISTRICT COUNCIL, Suffolk County Council

National Grid Reference: TM 461595 Area: 534.34 (ha.) 1,319.82 (ac.)

Ordnance Survey Sheet 1:50,000: 156 1:10,000: TM 45 NE, TM 46 SE

Date Notified (Under 1949 Act): 1955 Date of Last Revision: –

Date Notified (Under 1981 Act): 1986 Date of Last Revision: 1999

Other Information:

Part RSPB and Suffolk Wildlife Trust reserves.

The site was named 'North Warren and Thorpeness Mere', before the 1999 boundary revision.

Description and Reasons for Notification:

Leiston-Aldeburgh contains a rich mosaic of habitats including acid grassland, heath, scrub, woodland, fen, open water and vegetated shingle. This mix of habitats in close juxtaposition and the associated transition communities between habitats is unusual in the Suffolk Coast and Heaths. The variety of habitats support a diverse and abundant community of breeding and overwintering birds, a high number of dragonfly species and many scarce plants.

The heathland of North Warren, Aldringham Common, The Walks and Thorpeness Common is a fragment of the once extensive Sandlings heaths of coastal Suffolk and is of varying composition. There are patches of sand sedge *Carex arenaria* and heather *Calluna vulgaris* dispersed within acid grassland. Bracken *Pteridium aquilinum* and scrub, notably gorse *Ulex europaeus* and *U. gallii* also form part of the heathland. The short sward acidic grassland is dominated by sheep's-fescue *Festuca ovina* and common bent *Agrostis capillaris* with some bare patches, bryophytes and lichens. There is a varied associated flora including lady's bedstraw *Galium verum*, sheep's sorrel *Rumex acetosella* and the nationally scarce mossy stonecrop *Crassula tillea* and clustered clover *Trifolium glomeratum*.

On the vegetated shingle there is a gradual transition between the strandline community and the shingle heath resulting from increasing stability and distance from tidal influence. On the open shingle, sea-kale *Crambe maritima* and yellow horned-poppo *Glaucium flavum* are frequent with the irregularly occurring sea spurge *Euphorbia paralias*. The stable shingle areas support many species including early hair-grass *Aira praecox*, the nationally scarce sand catchfly *Silene conica*, dune fescue

Vulpia fasciculata, bur medick *Medicago minima*, suffocated clover *Trifolium suffocatum* and sea pea *Lathyrus japonicus*.

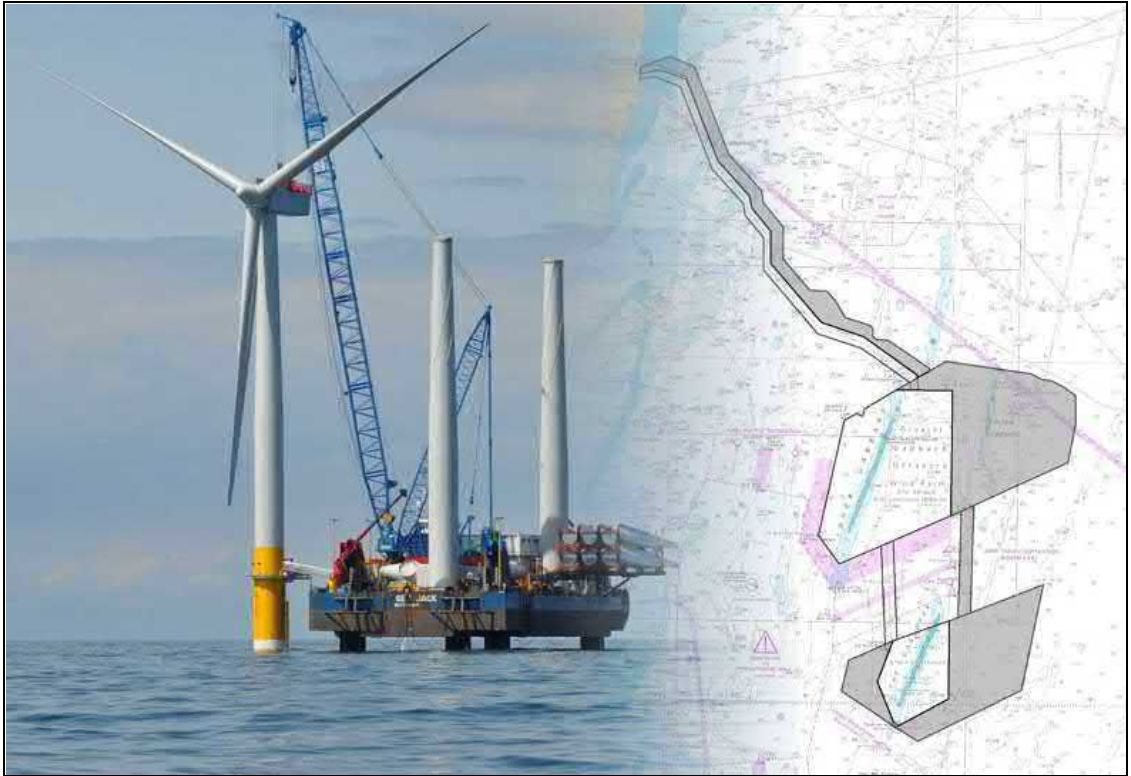
Thorpeness Mere is a shallow, eutrophic water body on a peat substrate. The adjacent areas of swamp and carr woodland are hydrologically dependant on the mere. To the south of the mere, grey willow *Salix cinerea* woodland surrounds a fragmentary mosaic of fen communities, mostly reed dominant *Phragmites australis* with nettle *Urtica dioica*, hemp-agrimony *Eupatorium cannabinum* and wild parsnip *Pastinaca sativa*. In the fen meadow areas there is a richer suite of species including a large colony of adder's tongue *Ophioglossum vulgatum*.

Church Farm Marshes south of the mere consists of grassland that is mostly a mix of creeping bent *Agrostis stolonifera*, Yorkshire-fog *Holcus lanatus* and perennial ryegrass *Lolium perenne* with frequent crested dog's-tail *Cynosurus cristatus*. It is dissected by ditches dominated by spiked water-milfoil *Myriophyllum spicatum* and fennel pondweed *Potamogeton pectinatus* with water-crowfoot *Ranunculus baudotii* in the shallow margins.

The Fens area is dominated by common reed *Phragmites australis* with occasional lesser bulrush *Typha angustifolia*, yellow iris *Iris pseudacorus*, great willowherb *Epilobium hirsutum*, purple-loosestrife *Lythrum salicaria* and nationally scarce marsh sow-thistle *Sonchus palustris*. Water mint *Mentha aquatica* is present in the understorey with cleavers *Galium aparine* and bittersweet *Solanum dulcamara* frequent in the drier areas. Surrounding, and in many places merging into the fen, is grey willow *Salix cinerea* woodland and alder *Alnus glutinosa* woodland with a field layer containing a mix of remnant swamp species.

Many species of bird regularly breed using the great mix of habitats available. These include nightjar, woodlark and skylark on the dry grassland and heath. The scrub and woodland supports tree pipit, turtle dove, bullfinch and nightingale. The marshes, the open water and their margins, in particular, support a diverse range of breeding birds, including water rail, marsh harrier, gadwall and grasshopper warbler. The site is also attractive to wintering waterfowl including Bewick's swan and bittern and regularly supports important populations of white-fronted goose, gadwall and teal.

The variety of water bodies and terrestrial habitats provides suitable breeding and hunting areas for many species of dragonfly and damselfly, including the nationally scarce hairy dragonfly *Brachytron pratense*.



Galloper Wind Farm Eastern Super Grid Transformer Project

Environmental Statement – Chapter 5 Terrestrial Ecology

February 2014

Document Reference – GWF/20/02/2014

Galloper Wind Farm Limited



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TERRESTRIAL ECOLOGY

5.1 Introduction

- 5.1.1 This chapter of the Environmental Statement (ES) assesses the potential impacts of the onshore infrastructure development associated with the Galloper Wind Farm (GWF) Eastern Super Grid Transformer (ESGT) on terrestrial ecology. Implications of the development on terrestrial habitats, including flora and fauna within the study area have been addressed. This assessment includes both positive and negative impacts, for the construction, operation and decommissioning phases of the development. Details of proposed mitigation that will be undertaken by GWF are also provided.
- 5.1.2 This chapter provides a summary of potential terrestrial impacts arising from the proposed ESGT. The GWF ES did not identify any potentially significant effects on ecology and a large volume of information is already held on the ecology of the site. This chapter is an addendum to the GWF ES Terrestrial Ecology chapter (GWFL 2012).
- 5.1.3 A programme of ecological mitigation works has been undertaken on the GWF onshore site since the project was granted Development Consent in May 2013. A description of this activity is provided in section 5.5 of this chapter.

5.2 Guidance and Consultation

Legislation, Policy and Guidance

- 5.2.1 National Policy Statements (NPS), including the NPS for Energy (EN-1) and Electricity Network Infrastructure (EN-5) (DECC, 2011a and 2011b, respectively) have been consulted as appropriate guidance.
- 5.2.2 The UK Post-2010 Biodiversity Framework succeeds the UK BAP and identifies the activities needed to achieve global targets on biodiversity agreed in Aichi Province, Japan in 2010, and known as the Aichi targets. The Framework sets out five strategic goals designed to ensure the targets are met:
- Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society
 - Reduce the direct pressures on biodiversity and promote sustainable use
 - To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity
 - Enhance the benefits to all biodiversity and ecosystems
 - Enhance implementation through participatory planning, knowledge management and capacity building

Consultation

- 5.2.3 Extensive consultation with statutory and non-statutory consultees regarding the associated onshore development of GWF was undertaken as part of the EIA process. Issues raised during the development of the GWF Development Consent Order (DCO) application are still considered relevant within the application for the ESGT. Full details of responses received regarding terrestrial ecology matters are presented in the IPC

Scoping Opinion report (IPC, 2010) and the Consultation Report that accompanied the GWF DCO application.

5.2.4 In November 2013, GWFL submitted a Scoping Report to SCDC requesting an opinion on the information to be provided in the Environmental Statement. A Scoping Opinion on the ESGT was received from SCDC in January 2014. Table 5.1 Lists the comments received in the Scoping Opinion which relate to Terrestrial Ecology.

Table 5.1 Summary of scoping report comments

Date	Consultee	Comment	Section of ES where comment is addressed
12/12/2013	Suffolk Wildlife Trust	We have read the ecology section of the Galloper Wind Farm Project Eastern Super Grid Transformer Scoping Report (Galloper Wind Farm Ltd, Nov 2013) and we are broadly satisfied with the scope of the assessment proposed. We acknowledge that a substantial volume of ecological survey information has been collected at the site over recent years and that this information supported the assessment of the larger substation scheme which has already received development consent as part of the Galloper Wind Farm project. We recommend that this existing information, including that collected in 2013, is used as the basis for an updated assessment of the potential impacts of the new proposals and identification of any necessary mitigation measures.	The baseline information collected for the GWF ES has been reused as the baseline information within this chapter and has been supplemented with information collected during ecological mitigation works in 2013.
13/12/2013	Suffolk County Council Economy, Skills, and Environment	Approach to the EIA We note the proposed updates to the information relating to noise, transport, terrestrial ecology, flood risk and archaeology. These will be importance to <i>verify</i> the reduced impact of the ESGT compared to the full works consented by the Order – for example it is stated that it is ‘expected’ that the ESGT will have a lesser impact and therefore a full assessment of ecology be scoped out. This expectation will need to be corroborated, particularly in relation to impacts on bats and reptiles.	This chapter of the ES contains an assessment of the potential impacts of the ESGT on terrestrial ecology, including on bats and reptiles.

5.3 Methodology

Study Area

- 5.3.1 The ESGT development footprint (as shown in Figure 1.1) is contained within the consented GWF onshore footprint. The ESGT compound will run north to south in alignment with the existing substation compounds. The study area includes the development footprint of the ESGT and the underground cable corridors required for electrical connections to the GWF and Leiston substations and any adjacent habitats that may potentially be impacted by the proposed development.

Characterisation of the Existing Environment

- 5.3.2 There is a substantial amount of available data associated with the ES submitted as part of the DCO application for GWF and the previous Greater Gabbard Offshore Wind Farm (GGOWF) studies, and their subsequent mitigation and monitoring programmes. The data available includes;

- Extended Phase 1 Habitat surveys (2005, 2006, 2010 (including detailed botanical assessments)) (CMACS, 2005; ESL, 2006; The Ecology Consultancy, 2010);
- Breeding bird surveys (2005, 2006 and 2008) (BTO, 2006; ESL, 2006);
- Great crested newt surveys (2005 and 2006) (CMACS, 2005; ESL 2006);
- Mammal surveys – including badgers, bats, water vole, otter and other protected mammals (2006) (ESL 2006);
- Reptile surveys (2006, 2007, 2010, 2011 and 2013) (ESL, 2006; ESL, 2007a; The Ecology Consultancy 2010; 2011 and 2013);
- Bat surveys (2006, 2007 and 2011 (including bat roost potential and activity)) (ESL, 2006; 2007b; The Ecology Consultancy, 2011);
- Badger survey 2010 (The Ecology Consultancy, 2010);
- Badger walkover survey 2011 (The Ecology Consultancy, 2011);
- Protected species mitigation surveys 2013 (The Ecology Consultancy, 2013b; 2013c).

- 5.3.3 Habitat and protected species surveys were undertaken to further inform proposals of the use of the area by protected species, as this factor could have the potential to be a constraint to development.

- 5.3.4 In addition to these surveys, baseline information for the area was compiled through a desk study and consultation with key stakeholders.

Assessment of Impacts

- 5.3.5 Impacts to terrestrial ecology have been assessed based on an approach adapted from the guidelines for Ecological Impact Assessment (EclA), which have been drawn up by the Institute of Ecology and Environmental Management (IEEM) (2006).

- 5.3.6 The approach to the assessment of impacts on terrestrial ecology can be summarised as follows:

1. Identification of the resource (baseline conditions);

2. Evaluation of the resource (assessment of value);
3. Identification of potential impact;
4. Determination of the effect of the impact;
5. Determination of the magnitude of the effect;
6. Assessment of the significance of any identified effects; and
7. Identification of any necessary mitigation or monitoring measures.

5.3.7 The criteria presented in Table 5.2 provides a guidance framework that indicates the likely level of significance.

Table 5.2 Effect of significance matrix

		Sensitivity / Value				
		International	National	County	Local	Negligible
Magnitude	High	<i>Major</i>	<i>Major</i>	<i>Major</i>	<i>Moderate</i>	<i>Negligible</i>
	Medium	<i>Major</i>	<i>Major</i>	<i>Moderate</i>	<i>Minor</i>	<i>Negligible</i>
	Low	<i>Moderate</i>	<i>Moderate</i>	<i>Minor</i>	<i>Negligible</i>	<i>Negligible</i>
	Negligible	<i>Minor</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>	<i>Negligible</i>

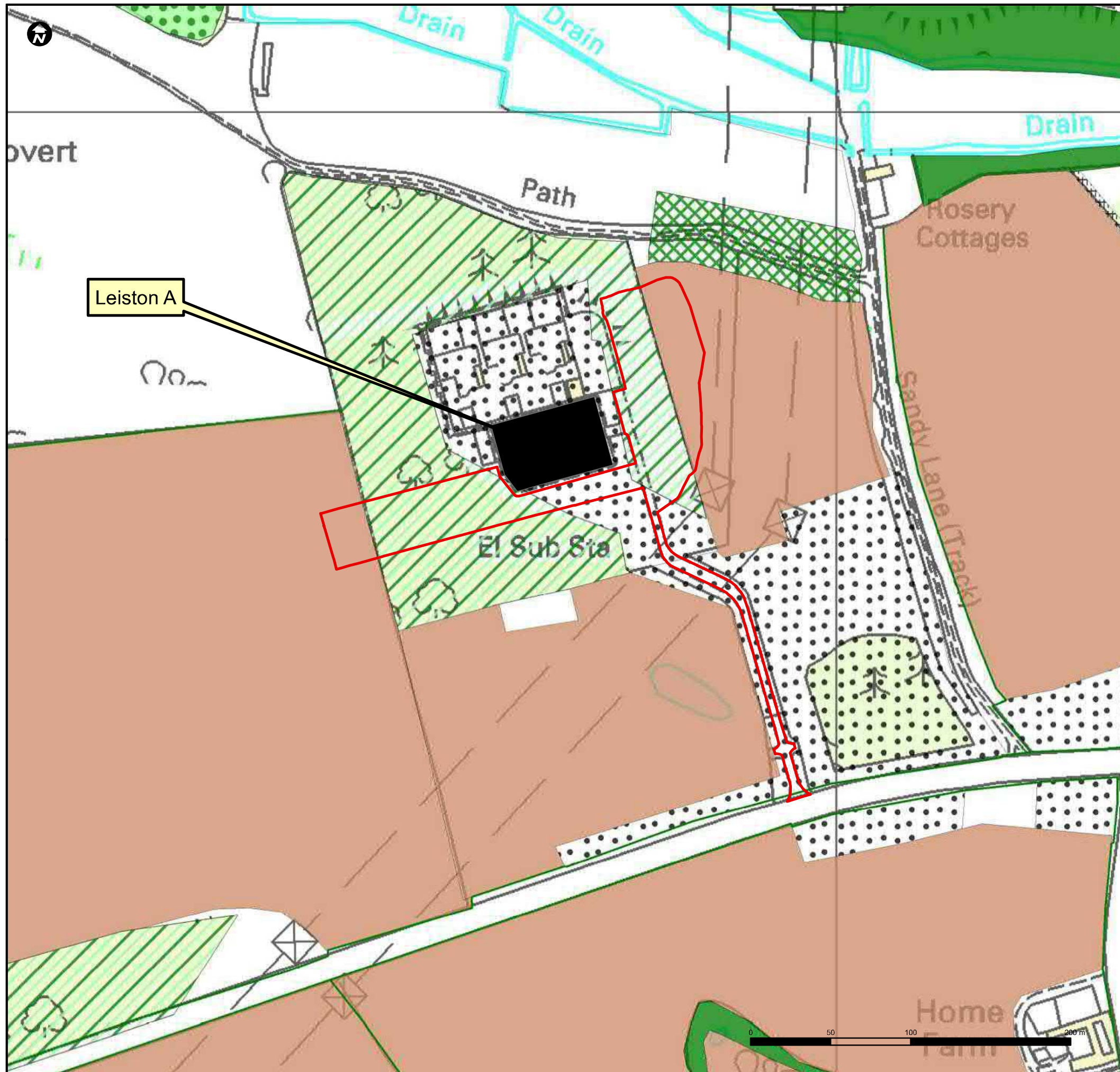
- 5.3.8 This approach to assessment has been fully implemented into the GWF ES Chapter 23 Terrestrial Ecology. Full details of the approach to the assessment can be found from Paragraph 23.3 onwards (GWF ES, 2011).

5.4 Existing Environment

- 5.4.1 This section describes the current situation with regard to the habitats and species recorded at the proposed ESGT.

Habitats and Flora

- 5.4.2 The predominant habitats in the study area are arable farmland, semi-natural broadleaved and mixed woodland, plantation woodland and semi-improved grassland. The proposed ESGT is located largely on plantation broadleaved woodland and arable land. Additional arable land is found to the west of the proposed ESGT site, with an area of bare ground to the south and dense continuous scrub to the north east. Figure 5.1 identifies the habitats present within the ESGT application area.
- 5.4.3 Previous surveys of the woodland have found that species such as mature and young Scots pine *Pinus sylevstris*, sycamore *Acer pseudoplanatus*, beech *Fagus sylvatica*, pedunculate oak *Quernus robor*, with occasional sweet chestnut *Castanea sativa* and an understorey of hawthorn, elder *Sambucus nigra*, and very occasional honeysuckle *Lonicera periclymenum*. The ground flora was sparse, characterised by: occasional common nettle *Urtica dioica*, ground-ivy *Glechoma hederacea*, red campion *Silene dioica*, and earthstar *Geastrum fimbriatum*.
- 5.4.4 The woodland is regarded as having a habitat value of local importance and a habitat value of negligible importance is considered appropriate for areas of arable land.



Overview map



Legend


- Eastern SGT red line boundary
- Leiston A NG substation
- J2.1.2 Intact hedge - species-poor
- A1.1.1 Broadleaved woodland - semi-natural
- A1.1.2 Broadleaved woodland - plantation
- A1.3.1 Mixed woodland - semi-natural
- A1.3.2 Mixed woodland - plantation
- A2.1 Scrub - dense/continuous
- B2.2 Neutral grassland - semi-improved
- B6 Poor semi-improved grassland
- C3.1 Other tall herb and fern - ruderal
- H6.4 Dune slack
- H6.5 Dune grassland
- H6.8 Open dune
- J1.1 Cultivated/disturbed land - arable
- J1.2 Cultivated/disturbed land - amenity grassland
- J2.4 Fence
- J2.6 Dry ditch
- J4 Bare ground

Cartographic information

Coordinate System: British National Grid
 Map Datum: OSGB1936
 Background data: Reproduced from Ordnance Survey digital map data
 © Crown copyright, All rights reserved. 2013.

Licence number 0100031673

Map information

			
<p>RWE npower renewable - Auckland House Lydiard Fields, Great Western Way, SWINDON Wiltshire, SN5 8ZT</p>	<p>PROJECT Offshore Windpark GALLOPER WINDFARM LTD</p>		
<p>TITLE FIGURE 5.1 - HABITATS PRESENT WITHIN THE ESGT APPLICATION AREA</p>			
<p>DRAWN RE57046</p>	<p>DATE 14.02.2014</p>	<p>SCALE 1:2,500</p>	<p>SIZE @DIN A3</p>
<p>DRAWING No. GWF_1115_R2</p>			<p>REV 02</p>

Reptiles

- 5.4.5 All four common reptile species found in the UK, common lizard *Zootoca vivipara*, adder *Vipera berus*, grass snake *Natrix natrix*, and slow worm *Anguis fragilis* were recorded in low numbers during the course of the 2006, 2007, 2010, 2011 and 2013 surveys. All common reptiles are subject to partial protection under the Wildlife and Countryside Act 1981 (as amended); are priority UK Biodiversity Action Plan (UK BAP) species and also Species of Principal Importance under the Natural Environment and Rural Communities (NERC) Act 2006.
- 5.4.6 Reptile surveys undertaken in 2006 and 2007 concluded that the woodland interior was not suitable reptile habitat given the dense shade and lack of suitable cover (ESL 2007a). It was established that the woodland edge habitat and other boundary features, such as hedge-filled paths did support populations of reptiles. This was confirmed during a reptile translocation exercise undertaken in 2007 prior to the GGWF substation works. Further surveys in 2011 confirmed again that the woodland edge habitats still supported reptiles within an absence of reptiles in the woodland interior. During a programme of reptile translocation was undertaken in 2013 as part the ecological mitigation works for GWF, 16 reptiles were caught within the area of the proposed ESGT (4 common lizard, 5 grass snake, 6 slow worm). A description of the ecological mitigation works undertaken in 2013 is provided in Section 5.5 of this chapter.
- 5.4.7 All common reptiles are priority UK Biodiversity Action Plan (UK BAP) species and Species of Principle Importance under the Natural Environment and Rural Communities (NERC) Act 2006 on account of their recent decline in numbers across the UK. All four common reptile species found on the site are afforded partial protection under the Wildlife & Countryside Act 1981 (as amended) making it an offence to:
- Intentionally kill or injure any reptiles; and
 - Trade any reptiles (i.e. sell, barter, exchange, transport for sale, and advertise to sell, or buy).
- 5.4.8 There are provisions in the legislation to allow actions to take place under licence, which would otherwise contravene the law.

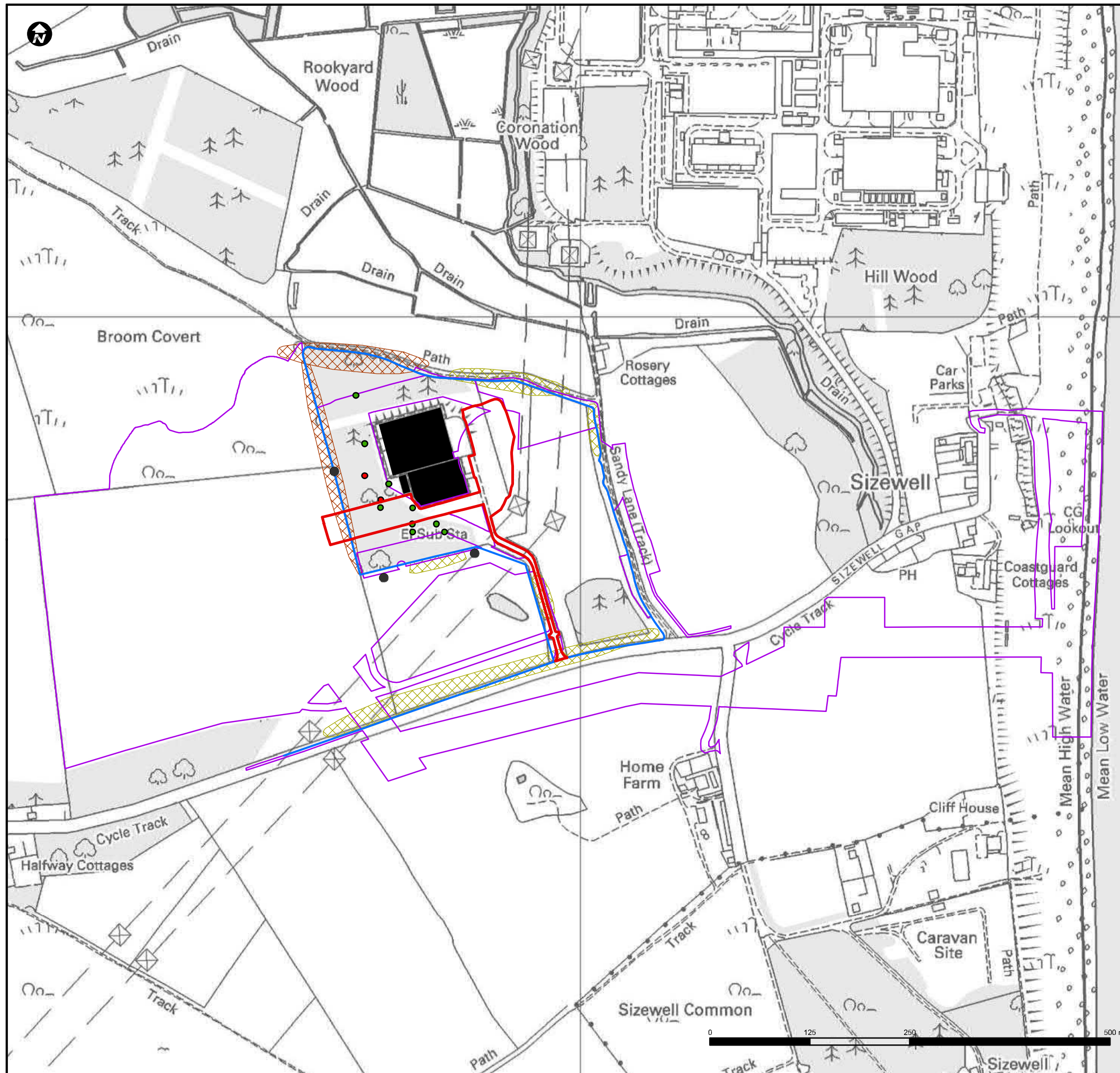
Bats

Bat roost potential

- 5.4.9 Sizewell Wents woodland was assessed for its potential to support roosting bats in 2006, 2007, 2011 and 2013. Survey work undertaken in May 2013 confirmed 38 trees with bat roost potential (The Ecology Consultancy, 2013a), none of which are in the area proposed for the ESGT. Species found in Sizewell Wents include common pipistrelle *Pipistrellus pipistrellus*, noctule *Nyctalus noctula*, soprano pipostrelle *Pipistrellus pygmaeus* and natterer's bat *Myotis nattereri*. Sizewell Wents and the surrounding land are likely to provide suitable foraging habitat and linkage between potential roost sites and/or foraging sites.
- 5.4.10 Figure 5.2 identifies the location of trees with bat roost and trees with potential bat roosts from the 2011 survey (GWF ES, 2012). A description of the ecological mitigation works undertaken in 2013 for the GWF site, including bat works, are provided in Section 5.5 of this chapter.
- 5.4.11 Based on the data gathered during surveys in 2006, 2007, 2011, and 2013, the site is considered to be used for foraging and commuting for up to ten species of bat. The site is currently likely to provide suitable foraging habitat for common species, particularly pipistrelles, as well as providing linkage between potential roost sites and/or foraging grounds for common and less frequently recorded species.
- 5.4.12 None of the bat roosts identified from the extensive survey effort are located within the proposed ESGT development footprint. There are however 4 bat roosts identified, with a further 38 trees with the potential to house bat roosts within the nearby area. Surveys undertaken in 2011 and 2013 identified areas of bat activity recorded on remote detectors within the ESGT area, but no bat activity was observed by the surveyors in this area.

Bat legislation

- 5.4.13 All bats in the UK are listed on Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) and schedule 2 of the Habitats Regulations. As such, GWFL has obtained a EPSM licence from Natural England for the tree felling necessary for the main GWF onshore site, as described in section 5.5 of this chapter.



Overview map



Legend

- Eastern SGT red line boundary
- Galloper Wind Farm Onshore Development Footprint/Order Limits
- Greater Gabbard Onshore Substation
- Route of bat transect
- Area of frequent activity
- Area of occasional activity
- Location of static detector
- Trees with Bat roost potential
- Trees with confirmed Bat roosts

Cartographic information

Coordinate System: British National Grid
 Map Datum: OSGB1936
 Background data: Reproduced from Ordnance Survey digital map data
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Map information



RWE npower renewable - Auckland House Lydiard Fields, Great Western Way, SWINDON Wiltshire, SN5 8ZT		PROJECT Offshore Windpark GALLOPER WINDFARM LTD	
TITLE FIGURE 5.2 - LOCATION OF BAT ROOSTS AND POTENTIAL BAT ROOSTS WITHIN THE GWF ONSHORE FOOTPRINT IDENTIFIED DURING 2011 SURVEYS			
DRAWN RE57046	DATE 13.02.2014	SCALE 1:5,000	SIZE @DIN A3
DRAWING No. GWF_1116_R1			REV 01

Nesting Birds

- 5.4.14 A breeding bird survey was undertaken in Sizewell Wents in 2008 (ESL 2008), immediately prior to the construction of the GGOWF and Leiston substations. A total of 21 bird species were recorded using the Sizewell Wents woodland. The most frequently encountered species were woodpigeon, goldcrest, and chaffinch. Table 5.3 lists the species identified during the 2008 survey, along with their conservation status. The survey data not record the position within the woodland that the species were recorded so it is not possible to say if they were seen within the proposed ESGT area.

Table 5.3 Bird species identified in Sizewell Wents during 2005 survey

Species	Wildlife and Countryside Act 1991 Schedule 1 species	Birds of Conservation Concern Red List	Birds of Conservation Concern Amber List	Suffolk BAP
Grey partridge <i>Perdix perdix</i>		X		X
Pheasant <i>Phasianus colchicus</i>				
Grey Heron <i>Ardea cinerea</i>				
Woodpigeon <i>Columba palumbus</i>				
Great spotted woodpecker <i>Dendrocopos major</i>				
Skylark <i>Alauda arvensis</i>		X		X
Pied wagtail <i>Motacilla alba</i>				
Wren <i>Troglodytes troglodyte</i>				
Dunnock <i>Prunella modularis</i>				
Robin <i>Turdus migratorius</i>				
Blackbird <i>Turdus merula</i>				
Fieldfare <i>Turdus pilaris</i>	X	X		
Song Thrush <i>Turdus philomelos</i>		X		X
Goldcrest <i>Regulus regulus</i>				
Long-tailed tit <i>Aegithalos caudatus</i>				
Blue tit <i>Cyanistes caeruleus</i>				
Great tit <i>Parus major</i>				
Magpie <i>Pica pica</i>				
Carrion crow <i>Corvus corone</i>				
Chaffinch <i>Fringilla coelebs</i>				
Goldfinch <i>Carduelis carduelis</i>				

- 5.4.15 Previous surveys, undertaken in 2005 and 2006 identified a number of other species within the overall bird survey area, although this stretched to a much wider area than the Sizewell Wents woodland. Species included grey heron *Ardea cineria*, sparrowhawk *Accipiter nisus*, and yellowhammer *Emberiza citrinell*.

- 5.4.16 All wild bird species in the UK are protected under the Wildlife and Countryside Act 1981. Birds listed in Schedule 1 of the Wildlife and Countryside Act 1981 are protected

at all times, and in addition to the protection from killing or taking that all birds, their nests, and their eggs have under the Act, Schedule 1 birds and their young must not be disturbed at the nest.

Water Vole and Otter

- 5.4.17 The habitats within the GWF works footprint are a mix of woodland and arable fields and do not support any water bodies. Consequently the site, including the ESGT compound is not considered suitable habitat for water vole or otter. In addition, the GWF footprint, including the ESGT compound is considered too far from any water bodies, including the Sizewell Marshes SSSI, to be suitable as potential habitat for an otter holt although there remains the potential for otter, being a wide ranging species, to traverse the area.
- 5.4.1 Given this information, there is no scope for there to be a potential impact on otter and water vole and therefore they have not been discussed further in this assessment.

Badger

- 5.4.2 During surveys in 2010, 2011 and 2013, no evidence of recent badger activity was found to the north of Sizewell Gap other than a disused sett.
- 5.4.3 Given this information, there is no scope for there to be a potential impact on badger and therefore they have not been discussed further in this assessment.

Great Crested Newts and other Amphibians

- 5.4.4 A desk study and consultation with local groups concluded that there were no records of great crested newt *Triturus cristatus* in the immediate area (CMACS, 2005; ESL, 2006). Surveys in 2005 and 2010 revealed no evidence of the species in the immediate area. The wider area does support common species of amphibian including smooth newt *Lissotriton vulgaris*, common toad *Bufo bufo*, and common frog *Rana temporaria*. However, as the ESGT compound is located on broadleaf woodland and arable land and lacks water bodies, it is considered to be of negligible value for amphibians.
- 5.4.5 Given this information, there is no scope for there to be a potential impact on amphibians and therefore they have not been discussed further in this assessment.

Other Species of Conservation Importance

- 5.4.6 Biological records and sightings during surveys indicated the presence of a number of other notable species in the study area including hedgehog *Erinaceus europaeus*, and brown hare *Lepus europaeus*, all listed within the Suffolk and UK BAP and adopted as species of Principal Importance in England under Section 41 of the NERC Act 2006). No other BAP or NERC species were recorded during the surveys.
- 5.4.7 Given these listings the area is regarded as of local value for these species.

5.5 Galloper Wind Farm Ecological Mitigation Works

5.5.1 A programme of ecological mitigation works was undertaken in 2013 as part of pre-construction works for the Galoper Wind Farm onshore site. The works undertaken are described in the following paragraphs:

Bats

5.5.2 A survey in May 2013 identified 38 trees within the Sizewell Wents woodland which had potential to host roosting bats. The 38 trees were within the area identified for the construction of the Leiston B substation and thus GWFL applied for, and later received a European Protected Species Mitigation (EPSM) licence on 15th August 2013. Soft felling commenced in September 2013 in line with the methodology proposed in the bat licence Method Statement (Reference EPSO 212-5178 D) along the access track which will run through the lower section of the Sizewell Wents woodland. During the works, a further bat species, Natterer's bat *Myotis nattereri*, was identified roosting during an endoscopic inspection of a beech tree. An amendment to the licence was applied for to include this species (The Ecology Consultancy, 2013c).

5.5.3 The remainder of the trees on the access track through Sizewell Wents will be felled in February 2014, prior to the start of construction of the main GWF onshore elements. The trees will be checked for the presence of bats before they are felled, and if a bat is found, the tree will not be felled and a bat licence amendment will be applied for.

Nesting Birds

5.5.4 Habitat and protected species surveys were undertaken in 2013 during which evidence of use of the site by nesting birds was found. In March 2013, 15 bird boxes were installed in areas of retained woodland to compensate for the loss of nesting habitat associated with tree felling in Sizewell Wents. Although the area of tree felling in the woodland will be reduced if the ESGT is built in place of Leiston B, the 15 bird boxes will remain in the woodland to provide additional nesting habitat.

Reptiles

5.5.5 Following the granting of the DCO, ecological mitigation works for reptiles began at the GWF onshore site. A reptile translocation area which had been identified in the original GWF EIA was fenced off from the rest of the site and artificial hibernacula were constructed using brash and logs. The pile was sown with a wildflower seed mix and turf and moss added to ensure the habitat was suitable for reptiles. Reptile fences were put up around the perimeter of the GWF site and internal compartments were created with extra reptile fencing.

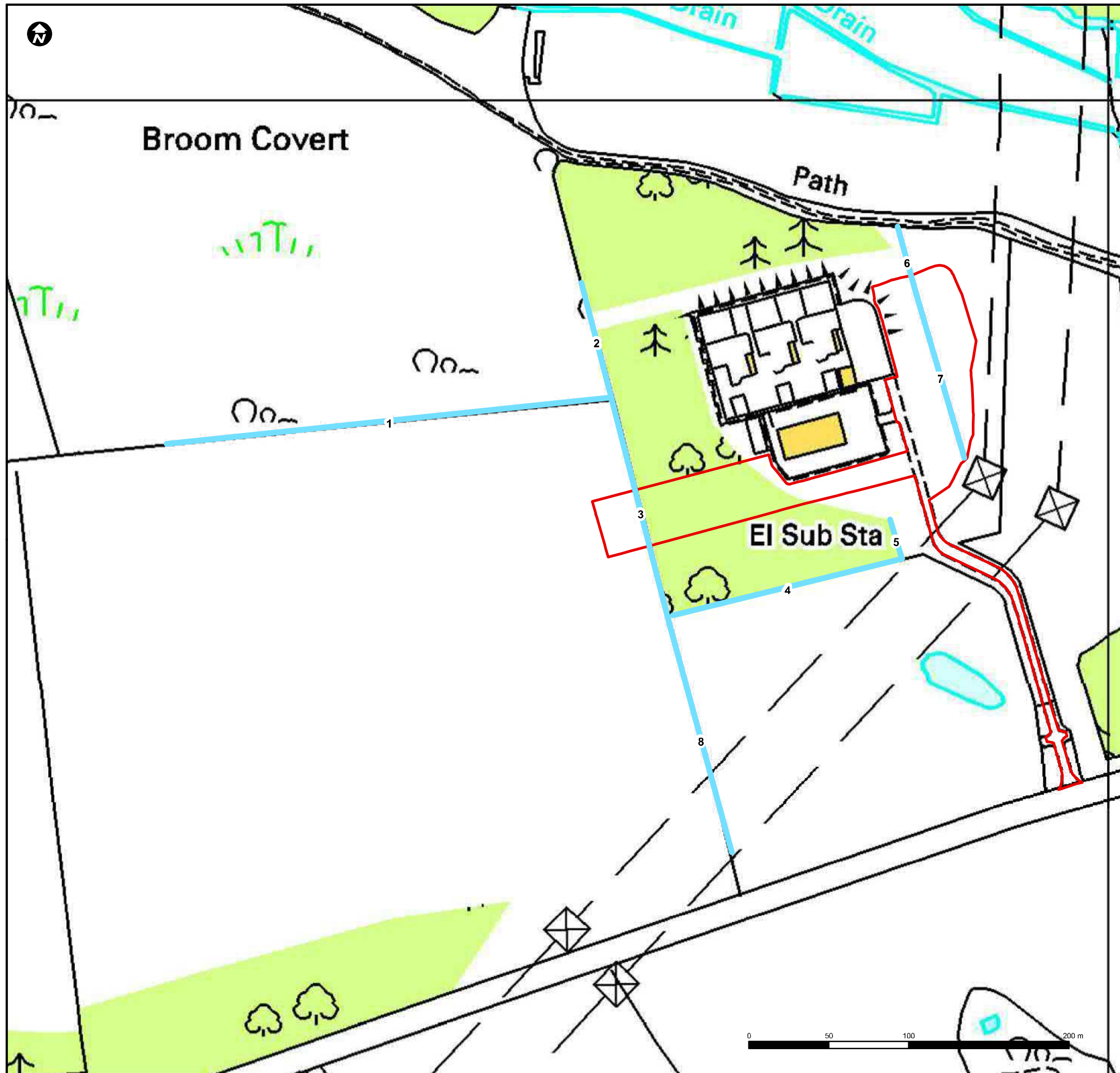
5.5.6 Following the fencing, a programme of reptile translocation began in June 2013 to trap and translocate reptiles from within the construction area to the reptile translocation area. A total of 71 visits were undertaken in total but due to the hot weather, animals were still being caught occasionally at the end of the visiting period. Some vegetation clearance was undertaken under ecological supervision in order to aid the trapping process. By mid-August, after 71 visits, it was decided that the trapping and translocation process could be considered complete. As a precaution, the fencing and artificial refugia (in this case, pieces of roofing felt) were left in situ to be checked on an ad-hoc basis until the destructive search is completed.

5.5.7 During the reptile translocation, a total of 96 individuals were caught throughout the GWF onshore site, including in the proposed ESGT area. Table 5.4 shows the number,

species and area in which each individual was caught. Figure 5.3 shows the location of the reptile trapping areas within the GWF site.

Table 5.4 Number of captures across 71 visits per location and species

Location	Species				Total
	Adder	Common Lizard	Grass Snake	Slow Worm	
1	3	18	3	35	59
2	0	0	0	3	3
3	1	1	3	5	10
4	0	3	1	2	6
5	0	1	0	0	1
6	0	0	0	2	2
7	0	5	5	4	14
8	0	1	0	0	1
Total	4	29	12	51	96



- Legend**
- Reptile capture locations
 - Eastern SGT redline boundary

Cartographic information
 Coordinate System: British National Grid
 Map Datum: OSGB1936
 Background data: Reproduced from Ordnance Survey digital map data
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Licence number 0100031673
Map information



Galoper
Wind Farm Ltd

RWE npower renewable - Auckland House Lydiard Fields, Great Western Way, SWINDON Wiltshire, SN5 8ZT		PROJECT Offshore Windpark GALLOPER WINDFARM LTD	
TITLE FIGURE 5.3 REPTILE MITIGATION SURVEY CAPTURE LOCATIONS			
DRAWN	DATE	SCALE	SIZE
RE57046	18.02.2014	1:2,500	@DIN A3
DRAWING No.			REV
GWF_1117_R1			01

5.6 Assessments of Impacts – Worst Case Definition

- 5.6.1 The worst case definition for the ESGT is that the construction of the compound will lead to a loss of 0.17ha of the Sizewell Wents woodland and 0.4ha of arable land. It should be noted however that the proposed ESGT will replace the consented Leiston B substation and associated cable corridors which would have led to a loss of 1.2ha of the Sizewell Wents woodland. The underground cables required to connect the GWF compound with Leiston substation and the ESGT to Leiston substation will not require any further tree felling.

5.7 Assessment of Impacts during Construction

- 5.7.1 In the following section, all assessments of significance are concluded as a result of the information provided and assessments of significance reached within Chapter 23 Terrestrial Ecology of the GWF ES (2012), alongside the terrestrial ecology update provided within this Chapter, as an addendum to the GWF ES.

Habitats and Flora

- 5.7.2 The proposed ESGT development footprint will take up 0.4ha of arable land which is considered to be of negligible ecological value, therefore, given the small area lost to the development, the effect of habitat loss will be of **negligible significance**.
- 5.7.3 0.17ha of the proposed ESGT development footprint encompasses woodland. Sizewell Wents is a young plantation woodland of relatively low ecological value but still represents a habitat of local importance. The underground cable which is required to connect the GWF substation with Leiston substation run along the north of the access road through Sizewell Wents and will not require any further trees to be felled above those to be felled for the access road corridor. Only a small portion of the Sizewell Wents woodland will be directly impacted and represents an impact of no more than **negligible significance**.
- 5.7.4 Beyond direct habitat loss, there are no potentially significant effects requiring further consideration. There are no predicted significant impacts associated with the ESGT and therefore no mitigation is proposed. It should be noted that the ESGT is proposed to replace the consented Leiston B substation which, including the associated cable corridors, would have led to a loss of 1.7ha of mixed plantation woodland.

Reptiles

- 5.7.5 Vegetation clearance and destructive works associated with the construction phase will have the potential to kill or injure reptiles using these areas, which are offences under the Wildlife and Countryside Act (1981). The works have the potential to result in the permanent loss of potential feeding, basking, refuge, and hibernating areas. The ESGT access and gravelled areas of the compound have the potential to create a net increase in basking opportunities for reptiles.
- 5.7.6 Although the ESGT footprint area is predominantly located on arable land, areas of woodland edge associated with the footprint have the potential to be affected by the construction works.

- 5.7.7 The low capture rate experienced during the translocation programme (The Ecological Consultancy 2013) has demonstrated the low intrinsic value with regard to reptiles. With the habitat value of County level importance and the small extent of habitat loss, the potential impact on reptiles is predicted to be no more than a **minor adverse impact**.

Mitigation and residual impacts

- 5.7.8 Mitigation will be employed during the construction phase of the main GWF onshore site, in line with plans already agreed with the local authority. The planned mitigation measures will also provide mitigation for the ESGT, due to the close proximity of the areas. Agreed mitigation includes the following:
- Further habitat improvements (to improve the reptile carrying capacity) will be undertaken at the identified reptile receptor site, including creating wood piles to provide reptile refugia and improving habitat connectivity between the receptor site and Sizewell Wents
- 5.7.9 In addition, the following best practice measures will be implemented to ensure the potential impacts on reptiles is minimised:
- All works on site that could potentially cause harm to reptiles (e.g. installation and removal of exclusion fencing and habitat manipulation) will be supervised by a suitably qualified ecologist (a watching brief).
 - The ESGT area will be checked for reptiles and a programme of translocation carried out if necessary, prior to the commencement of works.

Bats

Direct disturbance to roosting bats

- 5.7.10 None of the bat roosts identified from the extensive survey effort are located within the proposed ESGT development footprint, therefore the ESGT project will not result in direct impacts to bats.

Indirect disturbance to bats

- 5.7.11 The works will lead to the permanent loss of 0.17ha of woodland within Sizewell Wents. As Sizewell Wents woodland is situated within arable land on the outskirts of the larger Sizewell Estate, there is limited connectivity between wider bat habitats. Works conducted outside of daylight hours have the potential to indirectly disturb or displace bats through the use of lights, noise and general site presence. There is however, an abundance of optimal bat foraging and commuting habitat within the wider area.
- 5.7.12 Given the limited potential for disturbance to key commuting/foraging corridors, even though the bat assemblage in and around the ESGT compound is of national value, the predicted significance of impact is considered to be no more than **negligible**.

Mitigation and residual impacts

- 5.7.13 Mitigation, to ensure that the construction activities do not contravene wildlife protection laws, has been employed into the area of the main GWF onshore site including the

installation of bat boxes, and soft felling of trees under supervision. Mitigation which has been agreed for the overall GWF onshore site includes;

- Tree planting which, after maturing, will offer alternative suitable habitat;
- Bat boxes will be introduced in to the retained woodland to increase the potential for the area to support roosting bats in the future;
- Lighting used will be sensitive towards foraging and commuting bats.

5.7.14 Given the mitigation already employed residual impacts for indirect disturbance is predicted to be of **negligible significance**.

Nesting Birds

5.7.15 Nesting birds may experience both direct impacts from a loss of habitat and indirect impacts associated with disturbance during the construction works.

5.7.16 Given that the ESGT development footprint includes suitable nesting habitat, there is the possibility of damaging an active nest site during construction, such as with vegetation clearance. This represents an impact of low magnitude and a **negligible impact** is predicted in the absence of mitigation.

5.7.17 The potential effects of disturbance during construction work are in most instances short-term; however any disturbance to nesting birds as a result of construction activities would represent an impact of medium magnitude due to the low bird population in the immediate area. Given that the study area is considered to be of local sensitivity for breeding birds, an impact of **minor significance** is predicted in the absence of mitigation.

Mitigation and residual impact

5.7.18 Mitigation to be adopted during the construction, which will extend to cover activities related to ESGT compound works, includes;

- Vegetation clearance, including tree felling, where possible will be undertaken outside of breeding season;
- Measures taken to discourage nesting within the area and prevent nesting within felled/cleared vegetation;
- All trees to be cleared will be checked for the presence of breeding birds immediately before clearance and if a nest is found, the tree will not be felled and a buffer zone will be implemented and maintained until the birds have fledged;
- All clearance works will be undertaken under the supervision of an ecologist;
- Best practice noise control and management measures such as those set out in the Construction Code of Practice (see Appendix 3.1) to be implemented;
- Lighting will be sensitive towards nesting birds; and
- Bird boxes have been installed on retained trees within Sizewell Wents.

5.7.19 With the outlined mitigation in place and the temporary and localised habitat losses will result in impacts of **negligible residual significance**.

5.8 Assessment of Impacts during Operation

5.8.1 There will be limited operational disturbance as a result of human presence as for the majority of operational time, the ESGT will be unmanned. The electrical cables required to connect the ESGT to Leiston substation and Leiston substation to the GWF compound will be underground and therefore will have no operational impact on terrestrial ecology. An overall **negligible impact** is anticipated upon receptors.

5.8.2 As the site will be unmanned, there is no need for permanent lighting of the ESGT compound or plant. Lighting will only be used when the ESGT is undergoing maintenance. Without mitigation, lighting has the potential to disturb the terrestrial species considered in this chapter.

5.8.3 There are unlikely to be any other additional operational impacts on terrestrial ecology once the ESGT is installed.

5.8.4 There may be limited disturbance associated with the operational noise of the substation, however this is expected to be below levels expected to disturb any species identified on site.

5.8.5 Overall the anticipated significance of impact during the operational phase is **negligible**.

Mitigation and Residual Impact

5.8.6 Lighting provisions will be sensitive towards terrestrial species, mirroring commitments made within the construction mitigation proposed for the already consented Leiston B substation. This mitigation combined with the sporadic need for site maintenance, an overall **negligible impact** is anticipated.

5.8.7 With the outlined mitigation in place, the operational phase of the ESGT is expected to result in **negligible impacts**.

5.9 Assessment of Impacts during Decommissioning

- 5.9.1 When GWF is decommissioned it will adhere to any future or modified legislation relevant at that time.
- 5.9.2 The demolition of the ESGT will lead to temporary disturbance, of at worse a similar scale and magnitude to that of the construction phase, albeit without the removal or earthworks. As such the relevant impacts in the construction section of this assessment should be referred to along with any proposed mitigation.
- 5.9.3 Given the temporary disturbance associated with demolition works a **negligible effect** on terrestrial ecology is anticipated following mitigation.

5.10 Inter-relationships

- 5.10.1 Inter-relationships which are considered relevant to terrestrial ecology include noise.

Noise

- 5.10.2 Construction noise is expected to arise during the construction phase and will represent a temporary disturbance for birds and could result in some short-term displacement of birds closest to the works. The potential effects of disturbance during the construction work are short-term; however, any disturbance to nesting birds as a result of construction activities would represent an impact of high magnitude. The study area is considered to be of local value to nesting birds and a temporary **minor adverse** impact is anticipated in the absence of mitigation.
- 5.10.3 The ESGT will contain one super grid transformer (SGT) while the consented Leiston B substation (which the ESGT will replace) was going to contain two SGTs. The second SGT will now be housed within the existing GGOWF substation building. Therefore, the ESGT will result in an overall reduction in noise on the overall GWF site because it will contain less plant. The potential impact of noise on terrestrial ecology is therefore expected to reduce in comparison to the consented GWF project.

Mitigation and residual impacts

- 5.10.4 A range of mitigation measures will be employed during the construction phase of the development. These will include those listed in within the Construction Code of Practice (appendix 3.1) for GWF, which is expected to be applied to the ESGT.
- 5.10.5 Implementation of the noise control measures outlined in Chapter 6 will ensure that construction related noise is maintained below the accepted 65dB threshold. However, there will still be the potential for the short-term displacement of birds closest to the works. As such minor adverse residual impact remains.
- 5.10.6 During the operational phase, there may be limited disturbance associated with the operational noise of the ESGT, however the compound will contain less plant than the consented Leiston B substation and therefore the noise levels will be lower. The potential noise impacts arising from decommissioning are expected to be of similar magnitude to those predicted during the construction phase.

5.11 Cumulative Impacts

- 5.11.1 The impacts identified during the construction of the ESGT that have the potential to result in cumulative effects comprise:

Construction

- 5.11.2 The construction of the ESGT will take place at the same time as the construction of the GWF onshore site. The GWF ES states that the following cumulative effects may arise from during the construction period:

- Damage and disturbance to designated habitats and associated species within Sizewell Marshes SSSI and Suffolk Shingle Beaches CWS
- Damage and loss of BAP habitats of conservation importance
- Temporary and permanent disturbance/loss to area of optimal reptile habitat
- Disturbance to key bat commuting/foraging corridors
- Damage or disturbance to nesting bird species
- Disturbance to badge foraging habitat and low probability of disturbing any active sets
- Temporary and permanent loss of small areas of suitable terrestrial invertebrate habitat; and
- Potential harm to hibernating hedgehogs

- 5.11.3 It is expected that the ESGT construction period may have the following effects:

- Permanent disturbance/loss of areas of optimal reptile habitat
- Damage or disturbance to nesting bird species

- 5.11.4 The impact of the above effects is expected to be **minor** for the ESGT and mitigation measures will be put in place which is expected to reduce the potential impact further.

Operation

- 5.11.5 No impacts with effects above negligible are anticipated for the operational phase of the ESGT. The GWF ES did not predict any operational impacts above negligible for the

GWF site, therefore no cumulative impacts are predicted to arise from the operation of both the ESGT and the rest of the GWF onshore site.

Decommissioning

5.11.6 It is likely that the ESGT and the rest of the GWF compound would be decommissioned at the same time when the operational lifetime of GWF comes to an end. Assessments of the potential impacts during decommissioning arising from both the ESGT and the GWF onshore site predicted impacts of negligible significance. It is expected that the ESGT decommissioning period may have the following effects:

- Permanent disturbance/loss of areas of optimal reptile habitat
- Damage or disturbance to nesting bird species

5.12 Monitoring

5.12.1 Due to the predicted absence of a significant impact of the ESGT on terrestrial ecology, no specific monitoring or mitigation is proposed.

5.12.2 A long term landscape maintenance and management plan has been agreed as part of the mitigation plan for the GWF onshore site. The plan will be implemented to ensure the successful establishment of any new planting associated with the new landform. The management of the woodland will include measures to maintain diversity of flora (e.g. control of sycamore regeneration and selective thinning to encourage a diverse ground flora). Although the landscape maintenance and management plan has been designed to mitigate for the GWF onshore site, the establishment of new planting will benefit the whole onshore site, including the proposed ESGT area.

5.12.3 The ESGT construction project will be subject to the same site management controls as the main GWF onshore site, as set out in the Construction Code of Practice. Section 9 of the Construction Code of Practice (Appendix 3.1) sets out the control measures which relate to terrestrial ecology.

5.12.4 No other monitoring is proposed for terrestrial ecology.

5.13 Summary

5.13.1 Table 5.5 provides a summary of the predicted impacts associated with the construction, operation and decommissioning of the ESGT upon the terrestrial ecology resource.

Table 5.5 Summary of impacts upon terrestrial ecology

Description of Impact	Impact	Potential Mitigation Measures	Residual Impact
Construction Phase			
Habitats and flora	Negligible	No specific mitigation measures are proposed in the absence of significant impact	n/a
Reptiles (woodland edge within the ESGT footprint)	Minor adverse	All works on site that could potentially cause harm to reptiles (e.g. installation and removal of exclusion fencing and habitat manipulation) will be supervised by a suitably qualified ecologist (a watching brief). The ESGT area will be checked for reptiles and a programme of translocation carried out if necessary, prior to the commencement of works.	Negligible
Bats (bat roosting)	No impact	N/A	N/A
Bats (indirect disturbance)	Negligible	Mitigation measures agreed for GWF: <ul style="list-style-type: none"> Bat boxes will be introduced in to the retained woodland to increase the potential for the area to support roosting bats in the future. Lighting used will be sensitive towards foraging and commuting bats. Tree planting which, after maturing, will offer alternative suitable habitat; 	Negligible
Nesting Birds	Minor adverse	<ul style="list-style-type: none"> Vegetation clearance, including tree felling, will avoid the breeding season. Measures will be taken to discourage nesting within the affected area All clearance works will be undertaken under the supervision of an ecologist; Best practice noise control and management measures such as those set out in the Construction Code of Practice (see Appendix A3.1) to be implemented; Lighting will be sensitive towards nesting birds; and Bird boxes have been installed on retained trees within Sizewell Wents. 	Negligible
Other species of Conservation Importance	Negligible	No specific mitigation measures proposed in the absence of significant impact	No effect
Operational Phase			
Operational Impacts	Negligible	Lighting provision to be sensitive towards ecological receptors. Site personnel to be briefed on appropriate conduct when on site.	Negligible
Decommissioning Phase			
Decommissioning Impacts	As per construction	As per construction.	As per construction

- 5.13.2 The unmitigated impacts identified for the ESGT Project comprise minor adverse to negligible impacts during construction and decommissioning, although these are expected to be lesser effects than those assessed for the already consented Leiston B substation.
- 5.13.3 As a result of the change in location, size and extent of the development, a smaller area of ecologically important habitat would be removed during the ESGT construction in comparison to the consented Leiston B substation. Therefore the resultant direct impact and indirect disturbance to terrestrial ecology receptors will be of a lesser extent. It has been identified that there will be **no significant terrestrial ecology impacts** associated with other potential development in the area. Therefore, there are **no anticipated cumulative impacts**.

5.14 References

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SIZEWELL LAND MANAGEMENT
ANNUAL REVIEW 2013



EDF ENERGY NUCLEAR GENERATION
SIZEWELL ESTATE LAND MANAGEMENT ANNUAL REVIEW 2013

Highlights of the Year

- Higher Level Stewardship Agreement completed which will provide funding towards the management of the Sizewell estate for ten years.
- Sizewell B Amenity and Accessibility Fund awards £26,283 to four local projects
- Sizewell Estate features in BBC Countryfile programme
- Numbers of breeding Reed Bunting, Reed Warbler and Sedge Warbler recover following significant declines in 2012.
- Winter 2012/13 sees good numbers of wildfowl especially Wigeon, Gadwell and Teal
- Willow Emerald Damselfly recorded for the first time at Sizewell
- Little Egret breed at Sizewell for the first time

SIZEWELL LAND MANAGEMENT

ANNUAL REVIEW 2013

INTRODUCTION

The State of Nature report compiled by 25 wildlife organisations and published in May assessing the state of Britain's nature warned that many species of our wildlife are facing extinction unless urgent action is taken. It looked at more than 3000 native species of which 60% were in long term decline. Species requiring specific habitats have fared particularly poorly compared to the generalists to adapt to the country's changing environment. The threats to the UK's wildlife are many and varied, the most severe acting either to destroy valuable habitat or degrade the quality and value of what remains.

Climate change is having an increasing impact on nature in the UK. The unpredictable and erratic weather of the UK continued to provide a challenge for both the wildlife and our land management work at Sizewell. The first quarter of the year went from rain to snow and back to rain and so a lot of work was spent managing flooding either on the marshes or the access tracks. Following the coldest spring for fifty years, the summer was much warmer and drier than the previous two years and the year ended with a total rainfall of just over 611mm compared to 957mm in 2012. However an intense storm on 28th October caused considerable damage uprooting trees and taking out crowns particularly on oaks. It took a couple of days with three chainsaws to clear all the access tracks and paths around the estate with more work still to be done by contractors in Goose Hill.

Then on the evening of 5th December a huge tidal surge struck the east coast higher in places than the major surge of 1953. The Suffolk estuaries suffered badly with some sea walls collapsing and most over topped, flooding villages, marshes and farmland. Sizewell came off relatively lightly. The beach angle has changed, there was some over topping of the dunes and more erosion of the dunes at the north end but nothing that has required specific intervention.

SIZEWELL BELTS SSSI

The recent wet winter weather and trampling by deer has made access to the marshes increasingly difficult in places. The repaired sluice on Goose Hill marsh had new embankment "wings" and a high fence installed to prevent deer using it as a crossing. A section of the reedbed was cut with the new mower.



The dry summer made the mowing of the marshes much easier this year and all of the marshes were topped after the cattle had finished grazing.

Fourteen willows were pollarded on the western part of the SSSI to maintain their vigour and ensure their long term presence as a key landscape feature of the marsh landscape.



HEATHLAND

Leiston Common

The fencing that was erected over 15 years ago had started to rot and so and over 200m was completely dismantled and rebuilt as well as over 200 posts replaced. Four Dartmoor ponies grazed the site over the summer. Due to the large numbers of dog walkers on the Common it was felt a better option than sheep grazing. Bracken and Ragwort on Leiston Common has been 'topped'. The areas of Birch regeneration within heather areas have been cut high so as to avoid damage to developing heather. Grazing by sheep or ponies seems to have had little effect on the Birch, so some manual treatment will be necessary to avoid swamping out the heather areas.

If grazing is to continue on the Common, then the heather areas behind 'The Studio' and 'Wrayfield' will need to be fenced-off in order to allow them to develop properly. Bracken cutting is fairly ineffective and rolling/bruising of the large areas will be employed next season to try to tackle its dominance or if Asulox is available, then a spray application will be considered.

Retsoms

The flock of hebridean sheep has continued to have a positive impact on grazing the grass areas on Retsoms. However it is felt that they are preventing the heather areas to reach a mature phase and so having let the whole site rest over the summer the sheep were brought on in November and the heather areas have been excluded using electric fencing.

The Natterjack pond was pumped out and cleaned and the rains filled it back up ready for the new season. The pond was protected with netting as soon as spawn was found to protect the tadpoles from predation and on 24th June good numbers of toadlets were seen emerging from the pond.

WOODLAND MANAGEMENT

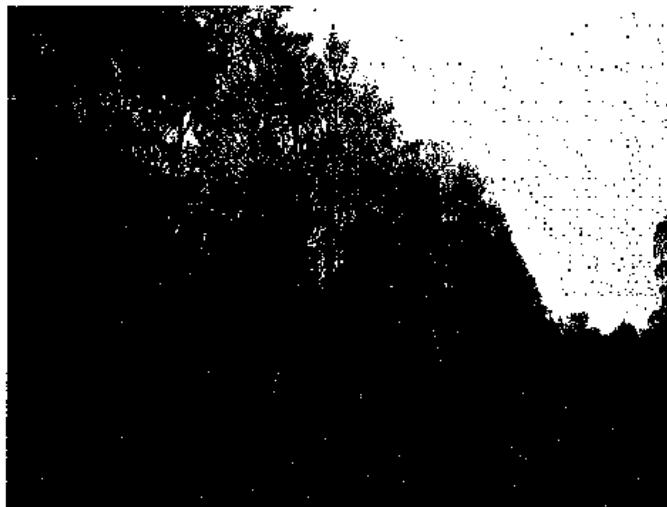
A variety of routine woodland work was carried out on the estate this year by the contractor Silvicultural Systems. Work in Goose Hill plantation concentrated on operations to ensure that recently planted trees were able to thrive and establish well. As part of the programme to restructure the age and species profile of the plantation, all young trees in compartment 1d were spot-treated with an herbicide to prevent the surrounding ground flora from competing for moisture. Any failed trees, broken stakes or shelters were replaced. To encourage vigorous growth in the young conifers and hardwoods the surrounding competitive woody growth was cut back to ground level. In compartment 1e, 4500 shelters were removed from the young trees and stands of competing Gorse, Bramble and thorn were cut back.

In the Kenton Hills plantation work concentrated on the felling of dead trackside Elm, located between the stacking area and Turf Pits. A total length of 420m of Chestnut pale fencing was removed from an area of established re-stock conifers.

In the Grove plantation, contractors removed tree shelters from the five metre tall, Ash, Cherry, Oak & Sweet Chestnut. In addition the contractors clear felled the pole-stage Sycamore regeneration, which was starting to suppress the growth of the planted stock. This silvicultural technique also has the additional benefit of increasing the levels of light reaching the woodland floor, which will benefit the woodland ground flora.

In the area of re-stock, within the woodland known as Fiscal Policy, the young trees and shrubs were spot-treated with herbicide, failed stakes and shelters replaced and the competitive vegetation surrounding the young trees & shrubs cleared, to encourage their development.

The October storm resulted in considerable damage to trees throughout the estate. Work is planned to clear up the storm damage but this will be carried out in an ecologically responsible manner. Log and brash piles will be created for reptiles and cracked limbs in the tree crowns will be retained wherever possible, to provide roosting sites for bats.



DEER MANAGEMENT

The deer cull figures for 2013 are as follows:

Period	Muntjac Deer	Red Deer
Q1	6	5
Q2	10	0
Q3	0	9
Q4	1	2

Discussions held with the stalkers in the spring of this year indicated that there had been an increase in the number of Muntjac seen throughout the estate. The stalkers estimated Muntjac numbers to be 20 and recommended the cull was carried on throughout the year, to keep on top of the problem. Muntjac deer are prolific browsers and cause damage to farm crops, trees, gardens and can have a detrimental impact on the floristically sensitive areas on the estate.

The stalkers have considerable experience of working on the Sizewell Estate and work closely with station security and staff to ensure the cull work is carried out safely and efficiently. The stalkers are a valuable pair of ears and eyes on the ground and their presence may help to prevent any poaching of the deer.

In the fourth quarter of this year the priority for the stalkers was to closely monitor the numbers and movement of Red Deer onto the Sizewell Estate. The stalkers will inform the Sizewell Land Management Group if the numbers increase significantly and will advise if the annual number to be culled has to be revised.



TREE RISK INVESTIGATION AND MANAGEMENT (TRIM)

A TRIM survey of the trees on the estate was carried out and concentrated on the 12 miles of public rights of way, which include roads, farm tracks, bridleways, footpaths and permissive paths. The purpose of the survey was to assess the health of the

trees along these rights of way and to ensure that any works required to make the trees safe are carried out.

The survey identified 32 compartment containing trees adjacent to public rights of way, of which eight compartments, contained trees requiring remedial work to make them safe. The majority of the work involves the simple task of removing dead branches which overhang a right of way or residential/commercial property. Within the eight compartments, a total of 462 dead standing Elm were recorded, some of which will need to be felled to prevent their collapse onto a right of way.

More complex tree surgery work will be required on a diseased mature Sweet Chestnut, which exhibits signs of crown die back and a number of fruiting fungi, located between the basal butts, were recorded. The tree can be made safe by reducing the crown and removing any dead wood. The crown of a dead, standing, multi-stemmed Sycamore, on the edge of the approach road to the station, will be reduced to stabilise the tree and remove the risk of dead wood falling into the road.

Overall, only two trees were recommended for felling throughout the entire estate: a dead ornamental Prunus, located at the entrance to Lower Abbey Farm represents a threat to the residents of the property; a mature Sycamore on the edge of the station approach road exhibits decay in the butt and could fall over the road.

TRACK REPAIRS

Considerable effort was made this year to improve the farm access road to Upper Abbey Farm. ADAS worked closely with the contractor Groupbridge to repair the potholes on the access road and to re-profile the farmyard. ADAS contacted the estate residents, the Suffolk Wildlife Trust, Mortiers, the tenant farmers, the Grazier and the postman to ensure the level of disruption during the work was kept to a minimum.

A drainage culvert in the yard was also repaired to prevent a repeat of the flooding, which was a common occurrence throughout the winter of 2012. The repairs appear to have been successful and have coped with a number of downpours experienced in the last quarter of 2013.

HIGHER LEVEL STEWARDSHIP SCHEME

The Estate was surveyed in April and an application for HLS funding was made to replace the expired Environmentally Sensitive Area (ESA) agreement. The new scheme will last for 10 years and will focus on the five key parcels of land within the Sizewell Marshes Sites of Special Scientific Interest (SSSI). In addition, funding from the scheme will facilitate the continued management of the main areas of existing heathland and reed beds. On arable land, in the north of the estate, a number of wildflower areas and wild-bird cover crops will be created.

The HLS scheme will allow a number of innovative capital projects to be carried out, including pollarding of Crack Willows on the Sizewell Belts, creation of a pond for Natterjack toads, bracken control on heathland sites and the creation of a Sand Martin nesting bank on the edge of Leiston Common.

Of particular significance will be the capital funding available to repair the livestock crossing points on the grazed marshes. The movement of cattle between the various compartments is essential if they are to remain in good condition for wildlife. The proposed work will improve the crossing points and allow cattle to move freely around the sites. The improvements to the crossing points will also make it easier for machinery to cut the marshes.

A replacement for the old cattle corral in the Abbey Marshes SSSI, will also improve the ability of the grazier to effectively manage his livestock on this beautiful and species-rich area, at the northern end of the estate.

A total of 30 nesting boxes will be erected around the estate to attract a variety of breeding birds.

ABBAY FARMS

The bird cover plot was sprayed off to reduce the thistle burden and several loads of manure were brought from SWT's Church Farm. This was spread and ploughed in using the 'new' second hand plough. The site was then drilled and rolled. To ensure there is a viable crop we have now rabbit fenced the entire field and this is proving to have been worthwhile with good numbers of Yellowhammers and Reed Buntings using the site.

SIZEWELL BEACH



The steps through the dunes have had to have extensive repairs, some parts replaced and some steps and platforms repaired. The temporary fence was again erected in the spring, which helps prevent trampling of the shingle flora, and resulted in a good display of both sea pea and sea kale. Despite our efforts though no ringed plover nested.

The Surge Tide on 5th December caused considerable erosion of the dune at the north end of site and overtopped the dunes in a few places, but compared to other sites along the coast it came through relatively unscathed.

GALLOPER WIND FARM

EDF Energy Nuclear Generation granted a licence to National Grid Electricity Transmission plc to enter Sizewell Wents woodland and adjacent land for the purposes of carrying out various ground investigation surveys. There is an obligation on the licensee to submit method statements and risk assessments (RAMS) to EDF Energy Nuclear Generation for approval and to procure that any surveys undertaken are carried out in accordance with the method statements.

The RAMS were submitted to Sizewell B on 15th May by South East Electricity Substation Alliance (SEESA), contractor for National Grid. Sizewell B confirmed SEESA / NG could go ahead and commence work on 10th June 2013. On 13th June one of the Sizewell Suffolk Wildlife Trust (SWT) Wardens reported to EDF Energy's Biodiversity Manager concern about potential disturbance to nesting birds from work taking place within Sizewell Wents. Whilst checking the grazing stock on Sizewell Marshes SSSI, the Wardens noticed a Grey Heron flying around in the vicinity of Sizewell Wents in an agitated manner. The Herons have nested in Sizewell Wents for a number of years. On further investigation they discovered a 360 degree excavator pushing over 30 foot tall sycamore trees. This action, with the amount of noise and tree-top disturbance immediately adjacent to the main nesting tree of the Herons, was clearly what had caused the distress to the Heron originally sighted.

Part 1 Section 1 of the Wildlife and Countryside Act states that it is an offence to 'take, damage or destroy the nest of any wild bird whilst that nest is in use or being built'. Whilst the nest had not been damaged at the time, the SWT Warden arrived on site, there was a risk that without appropriate mitigation in place, the nest could be damaged or destroyed. National Grid were asked to stop work pending investigation into the event. Suffolk Wildlife Trust reported the matter to Natural England. A second Heron's nest with chicks was subsequently located on 19th June.

The matter was investigated by EDF Energy. The Method Statements and Risk Assessments did not adequately describe the work activities, identify the main ecological sensitivities or put in appropriate mitigation controls. The RAMS was not sent to the Biodiversity Manager or Sizewell B ECC for review/advice. National Grid and SEESA submitted new method statements to the Biodiversity Manager for approval including supervision of the works by an on site ecologist. The works were then permitted to recommence.

SIZEWELL EMERGENCY RESPONSE CENTRE

The reptile fence at the Sizewell Emergency Response Centre was extended and repaired in April to ensure that the reptiles, removed prior to construction commencing, do not go back onto the site.

The ragwort on the reptile receptor site was removed in July and the grassland is being kept in good condition by the grazing of rabbits. The flower-rich turves placed on top of the hibernaculum have established well and are helping the structure to take on a natural appearance.

COMMUNITY

The SWT wardens organised five guided walks of the Estate but these were poorly attended with 3 having no attendees at all and the remaining two only attracting 2 people for each event. The local SWT group held their annual plant sale at Upper Abbey farm and raised £310 their best ever figure.

The Trust had a volunteer placement from Ipswich Town Football Club's Princes Trust scheme who spent two weeks shadowing the wardens in their work experiencing a work environment and interacting with people.

Sizewell B featured in an episode of the BBC flagship rural affairs programme Countryfile in November. The BBC crew were in the area for the Benjamin Britten centenary as the composer was a keen bird spotter on the Suffolk coast. They wanted to film the contrast of the power station coexisting with the natural environment of the AONB. Filming was carried out on the Sizewell Marshes with Alan Miller, the Suffolk Wildlife Trust warden installing a mink raft with presenter Julia Bradbury.

Sizewell B Amenity and Accessibility Fund

Planning permission was granted in July 2011 for the new Dry Fuel Store at Sizewell B. The Amenity and Accessibility Fund was developed to mitigate the impact of the new Dry Fuel Store on the Area of Outstanding Natural Beauty (AONB). The fund was designed to support projects that improve the amenity and accessibility of the AONB within the locality of Sizewell B and its environs. The main aims of the fund are to:

- Improve the environment and natural character of the area
- Conserve habitats and species
- Increase the enjoyment and experience of the AONB for residents and visitors
- Conserve and enhance the area's natural beauty
- Improve the visual appearance of the area
- Improve sustainable access to the area.

A total of £26,283 was awarded to four projects:

- Suffolk Wildlife Trust- £9,226 to restore 10.3ha of heathland in Rendlesham Forest to create a richer landscape for wildlife and people. Species to benefit will include woodlark, nightjar and silver studded blue butterfly.
- Eastfeast-£4,800 to engage local children and their families with the local birds and their birdsong using technology, art and horticulture.
- Pebble Media-£8,800 to produce short community based radio programmes by young people with learning opportunities within the media sector.
- Quiet Lanes Suffolk-£4,029 to establish, in co-operation with Suffolk County Council Highways, a pilot scheme of quiet lanes within the AONB.

The Fund is being managed by EDF Energy, Suffolk Coastal District Council and Suffolk County Council in consultation with Suffolk Coast and Heaths AONB.

SIZEWELL NEW BUILD REPTILE HABITAT CREATION

Kenton and Goose Hills Woodland

The open areas in Kenton Hills and in St James Covert are developing although gorse and birch are likely to prove a management issue in 2014. The areas were left undisturbed until late autumn and then flailed in the autumn. Vegetation was strimmed around the perimeter of the reptile exclusion fence on compartment one to prevent any reptiles from moving into the area prior to translocation.

St James Covert

St James Covert now has a rich mosaic of native woodland, shrubs and grassy open areas. The perimeter of the fence, on the outside, was cut to prevent vegetation forming a 'bridge' over the fence which could be used by reptiles to enter the excluded areas.

Estate Ex-arable Land, Part Rosery, White Gates and Red Rails Fields

These areas are now likely to be returned to arable use pending a decision on the location of the proposed campus.

BIODIVERSITY MONITORING

Breeding birds

All the usual areas were fully surveyed using BTO Common Bird Census methodology. See table in appendix for full results.

A total of 10 Biodiversity Action Plan species were recorded breeding. 2013 saw increases in skylark, song thrush, yellowhammer and reed bunting. For the first time in 22 years no turtle doves were recorded on site sadly a familiar situation mirrored around the country.

Wintering birds

The winter Wetland Bird Survey (WeBS) was carried out from January – March and again in September - December alongside the Farmland bird survey.

See tables in appendix for full results

Water voles

The annual survey was carried out and results submitted to the National Key Sites project. The results show a stable population.

Details of the survey can be found in the species section of this report.

Otters

Spraints and tracks have been found throughout the year indicating a continued presence.

Bats

Natterers bats were again found in the Kenton Hills bat boxes.

Brown hare

Sightings were recorded throughout the year. Animals were recorded on the all monthly farmland bird counts

Amphibians

Monitoring of the natterjack reintroduction continues. Results are in the amphibian section of this report.

Dragonflies

Only blue tailed damselfly and common red darter recorded in Lower Abbey pond

Moths

The Suffolk Moth Group had a trapping session on 4th June.

Butterflies

Two transect surveys were carried out

Adders

Monitoring projects are running both on the reptile plots at Upper Abbey and on Black Walks

Reedbeds

Vegetation surveys are undertaken every two years with the result details reported in the Fen vegetation monitoring programme report ELP July 2013. The current condition assessment is favourable.

Wet Woodland

No monitoring required, area stable

Coastal Grazing marsh

Monitoring undertaken for vegetation Site in favourable condition, see ELP report and summary in this report.

Breeding bird; WeBS and water vole monitoring undertaken.

Vegetated shingle

Area temporarily fenced for ringed plover and shingle vegetation. No breeding ringed plover.

Coastal dune monitoring

No monitoring undertaken

Lowland dry acid grassland

No monitoring undertaken

Cereal field margins.

Winter farmland bird surveys undertaken

Fens

Monitoring undertaken for vegetation Site in favourable maintained condition, see ELP report and summary in this report.

Breeding and wintering bird survey undertake

Species Recording

Plants

Fen Meadow monitoring

The fen meadow-monitoring programme entered its seventeenth year. A number of quadrats have been set up and are visited every two years on a rolling programme of visits. Changes are recorded and the results related to either management or natural fluctuations. A full report has been produced by Jonny Stone of OHES Environmental.

The report summary is as follows:

The report incorporates fieldwork data from six permanent vegetation plots - located in site compartments G4, G34, G38, G50, M7 and M9

The photographic record of the fen meadow plots shows the continued positive benefits of efforts to subdue the strong rush growth and promote low-growing vegetation. Previous problems with lodged vegetation were not evident, and the level of grazing and cutting management has produced very favourable vegetation structure for all fen meadow plots, except that in compartment G4, which was under-managed.

In terms of species richness, all plots recorded comparable numbers of species to recent years. Shifts in recorded species composition, often leading to a slight dip in species richness, has affected the small group of low-growing and uncommon fen mire species, including Flea Sedge *Carex pulicaris*, Slender Spike-rush *Eleocharis uniglumis* and Bristle Club-rush *Isolepis setacea* in plot G38. Their absence may reflect the exceedingly wet growing season in 2012, or may simply be due to

difficulties in recording at this later stage in the growing season. They should be searched for carefully in 2015.

The recent arrivals Marsh Lousewort *Pedicularis palustris* (G34) and Velvet Bent *Agrostis canina* (G50) have sustained their presence, while Marsh Arrowgrass *Triglochin palustre* has been re-recorded from plot G34. Devil's-bit Scabious *Succisa pratensis* was recorded for the first time from plot G50.

Natural England continues to quote the vegetation monitoring results to supplement the SSSI Condition Assessment for Sizewell Marshes, as reported on their website. The current 2013 assessment confirms our previous recommendation for **Favourable Maintained** condition, with particular note being taken of the continued improvement in sward structure.

Although it is recognised that the positive effects of stock-keeping and cutting machinery will continue to be mediated by variations in surface water ground conditions, the programme of management on Sizewell Belts continues to meet the national standards set for this conservation feature, and comfortably exceeds the threshold for floristic composition in the monitored compartments.

Invertebrates

Butterflies

SWT volunteer Trudy Seagon set up butterfly transects along the Upper Abbey Farm field margins in 2004 and has repeated the survey annually since that time. A total of 22 species were recorded in 2006 and again in 2007. This is probably the peak species count having started with 19 species in 2004. The 2008 survey reflected the weather with only 16 species recorded and a total of 336 individuals compared to 1591 in 2007. The 2009 season was a great improvement with a dry summer contributing to a species total of 20 and 1889 individuals, the highest individual total since the survey began. In 2010 the numbers recorded dropped back to the 2007 level with 1537 individuals recorded however the species count increased by two to 22 equalling the previous best counts.

The total number of individuals increased to an all time high in 2011 with 2094 butterflies seen over 24 visits however only 16 species were recorded. 2012 was an average year for population density however a total of 21 species were recorded.

This was the first year in which a transect had been set up and monitored on the Sizewell Belts and so no comparisons are available for previous years. However as could be predicted comparing a primarily agricultural transect with a SSSI wetland the SSSI was richer both in species and population density but the two transects will become more interesting in the coming years for comparisons particularly associated with the various weather factors.

Both 'Upper Abbey Field-Margins' and 'Sizewell Belts' butterfly Transects have been walked once a week, (weather conditions permitting) for the entire recording season from 1st April - 31st September (26 weeks). Details of the outcome of these will be automatically transferred to the UKBMS data-base, and results will be available once all records have been entered.

Sizewell Estate Butterfly monitoring 2013					
	Sizewell Belts transect		Upper Abbey Farm transect		
	Peak count		Peak count		
Meadow brown	664		545		
Ringlet	509		352		

Gatekeeper	136		96		
Small white	150		215		
Large white	78		99		
Green veined white	149		97		
Small skipper	1		3		
S/Essex skipper	2		125		
Large skipper	2		23		
Clouded yellow	1		1		
Orange tip	7		8		
Small copper	38		6		
Brown argus	1		2		
Common blue	12		6		
Red admiral	6		3		
Painted lady	1		0		
Small tortoiseshell	41		130		
Peacock	67		29		
Comma	17		7		
Speckled wood	26		3		
Grayling	14		6		
Small heath	16		10		
Totals	1938		1766		

Dragonflies

Whilst completing a walk of the new 'Sizewell Belts' butterfly transect, JS observed what is believed to be the first sighting of a Willow emerald damselfly on St. James' Marsh!

Norfolk hawk: Adults and teneral (freshly emerged insects) seen in good numbers on the Belts

Banded Demoiselle: Seen in small numbers at two places on site. On Lower Abbey Farm marshes along the main Minsmere River and on Goose Hill marshes along the Leiston Beck.

Emerald Damselfly: Seen in small numbers on Goose Hill marshes.

Large Red Damselfly: Common around the site.

Azure Damselfly: Very common on site.

Blue-tailed Damselfly: Common on site.

Small Red-eyed Damselfly: Now common on site

Southern Hawker: Common on site

Migrant Hawker: Common on site

Common darter: Some seen flying as late as 22nd November

Moths

The Suffolk Moth Group held a trapping session on 25th May. We are awaiting results from this visit.

Ant lions

The number of pits varies from year to year with weather and vegetation growth however the work carried out in 2007 proved beneficial. The 2008 count was 123 pits in the cattle yard and 89 in the new area outside. This was low compared to the peak count of 900 in 2004 but weather conditions and rabbit activity were the likely limiting

factors. The 2009 survey showed an overall increase with 377 pits in the cattle yard and 105 pits in the new area. The dry early summer in 2010 proved productive with a total of 1032 pits, the highest figure since the colony was discovered. The colony continued to expand with a slight increase of 1100 pits in 2011. The wet weather obviously had an impact on the 2012 season as only 550 pits were counted. In 2013 610 pits were counted but rabbit activity continues to make monitoring difficult with the ground being constantly disturbed.

Mammals

Otters

Spraints and foot prints were regularly found throughout the Belts indicating a year round presence.

Badgers

The original sett in Ash Wood continues to expand with several out lying holes dug throughout the wood and a second large sett is regularly occupied on the north side of the central ride. The animals have continued to expand their colonisation and additional setts have been appeared around the Estate including one in the pit beside Upper Abbey Farm.

Bats

The natterers bats were not evident in the barn until September when 15+ were found in one of the bat boxes suggesting they bred elsewhere and returned when the young were flying.

The annual bat box check in Kenton Hills was carried out in October. Seven boxes were occupied at the time with others showing signs of occupancy during the year. Three species of bats were found totalling 2 soprano pipistrelles, 3 noctules and 21 natterers bats.

Deer

Regular counts were made of red deer and muntjac throughout the year. A Chinese water deer was seen in Goose Hill on 16th Feb and again 14th May on Lower Abbey marshes.

Sea Mammals

Common seals were recorded off shore regularly between Jan-April and again in October

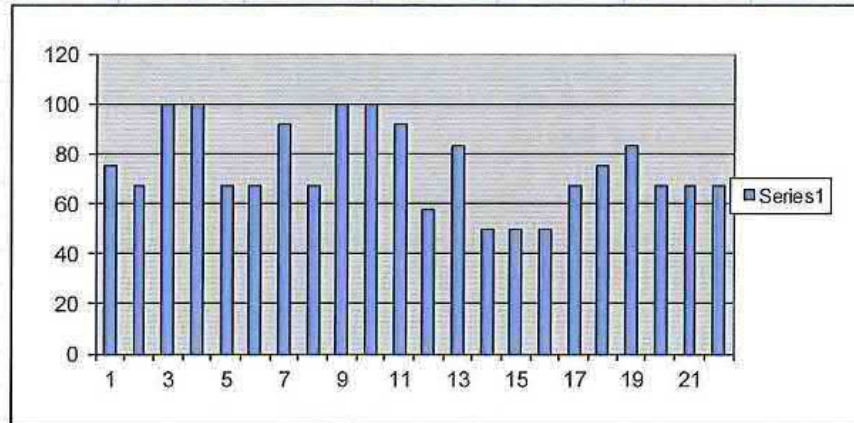
Two harbour porpoises were seen just offshore on 12th May

Water voles

The National Key Site monitoring programme continued with just autumn surveys as per the Royal Holloway College recommendations.

Percentage of transects at Sizewell NKS for Water Voles with active signs of water vole presence at each survey 2001 - 2012

Date	Pos	Neg
Spring 01	75	25
Autumn 01	67	33
Spring 02	100	0
Autumn 02	100	0
Spring 03	67	33
Autumn 03	67	33
Spring 04	92	8
Autumn 04	67	33
Spring 05	100	0
Autumn 05	100	0
Spring 06	92	8
Autumn 06	58	42
Spring 07	83	17
Autumn 07	50	50
Spring 08	50	50
Autumn 08	50	50
Spring 09	67	33
Autumn 09	75	25
Autumn 10	83	17
Autumn 11	67	33
Autumn 12	67	33
Autumn 13	67	33



positive=presence of fresh feeding signs and/or droppings
 negative=no fresh field signs present

Spring=May
 Autumn=September

The 2013 survey found presence in 67% of the transects but from the quantity of latrines the indication is there are less animals but still widespread through the site. A mink raft was deployed but no signs of this predator have been found to date. The requirement for UK analysis is now just one survey per year in the autumn, when the peak number of voles are present, due to juvenile recruitment.

Reptiles and amphibians

Natterjack toads

Following the creation of two ponds on Retsoms in 2004 specifically for natterjack toads a three year introduction programme started in 2005. Tadpoles were brought from Holme NNR in Norfolk and released into both ponds and this was repeated in 2006. One pond has a butyl liner and the second was constructed using bentonite clay. The bentonite clay pond has proved to be problematic and now no longer holds water. The butyl lined pond continues to function well and is pumped dry each winter to remove potential predators (water beetles and dragonfly larvae) and allowed to refill naturally with rain water. A permanent low fence was installed around the pond in 2009 and has allowed for improved protection supporting lengths of garden netting to prevent avian predators gaining access to the pond perimeter. The toads spawned in 2010 with some 2500 tadpoles seen feeding however no toadlets were known to have emerged but at least the adults appear to have survived the cold winter.

Following a second consecutive cold winter 2011 proved to be the best ever year for the toads. The first strings were laid in April from which toadlets emerged and a second spawning occurred in late July resulting in yet more successful metamorphosis.

In 2012 the toads produced 8 strings of spawn on 28th April resulting in many hundreds of tadpoles. The pond was covered with netting to reduce predation and by mid June there were around 5000 tadpoles starting to metamorphose ready to leave the pond. A second spawning occurred in early July, when a further 4-6 strings of spawn were seen. The pond water soon after was cloudy with the excessive rain and so this spawn did not survive.

In 2013 toads were seen mating and several thousand tadpoles hatched and on 24th June a good number of toadlets were observed emerging from the pond. The pond required topping up on one occasion.



Pumping out the natterjack pond

Photo: Dayne West

Reptiles

Jamie Smith began his Reptile Survey on Black Walks on the 14th. 20 corrugated tin sheets (to act as refugia) were placed around the area, with several return visits at intervals, to check if any reptiles were using them.

The results of the survey so far are that the site is relatively poor for reptiles, with only 2 Adder *Viper beris* and a single Grass snake *Natrix natrix* being recorded. This is significantly less-active than the more wooded and grassier areas of the Estate, where all species of reptile can be found in much greater densities. The tins did however prove to be particularly attractive to various species of Ant.



Adder on Black Walks

Photo: Dayne West

Sizewell Bird Report 2013

The details of the breeding and wintering surveys are to be found at the end of this report.

The following is a list of birds recorded on the estate during the period of this report but only refers to significant species and is not a total species list.

Systematic list;

Bittern	Birds were recorded on a number of occasions throughout the year
Little egret	This species bred on site for the first time with possibly two pairs nesting amongst the herons, this despite the disturbance from the wind farm development.
Grey heron	Three pairs nested and fledged young despite disturbance
Wigeon period	Peak count of 150 birds on Salt Marsh during first winter
Garganey	A pair were present on Salt Marsh 14 th May
Common Buzzard	A pair nested in Ash Wood
Hobby	A pair held territory on site

Snipe	A peak of 36 birds were recorded over the first winter period, a single bird was heard drumming on one occasion in spring
Jack snipe	Singles occurred on 14 th January & 11 th November
Turtle dove	No birds recorded breeding on site this year
Cuckoo	Only one territory was located on the estate
Barn owl	Birds have been present throughout the year though no nest was found
Woodlark	A bird was heard singing on Leiston Common on 2 nd April and at Upper Abbey Farm on 7 th April but no confirmation of breeding however up to 3 birds were present during the second winter period feeding with skylarks on the arable land.
Skylark	Only 7 territories were found but the survey was incomplete as not all of the arable land was surveyed however this does indicate a continued decline.
Nightingale	No birds held territory this year, the first time in 22 years no song was heard.
Cettis warbler	10 territories were found surprising after two hard winters
Willow warbler	A slight increase to 7 territories
Yellowhammer	A flock of 25 were found feeding on stubble during the first winter period
Reed bunting	8 territories found a welcome increase on the single pair in 2012

Summary

The key areas of the estate are surveyed during the breeding season using the BTO's Common Bird Census method of mapping all territories with the exception of the field margins which are treated as transects as in the BTO's Breeding Bird Survey methodology

The good spring weather meant that the recording effort was unimpeded with 7 visits made to each of the habitats. Territories for this year may reflect an increase in observer effort as much as an increase in the overall numbers compared to 2012.

The number of breeding species recorded in the survey areas totalled 64, still above the sites average over the past 13 years. Casual recording around the remainder of the estate brought the figure up to 66 species, which included black redstart, and kittiwake.

Common buzzards bred on site with a pair nesting in Ash Wood and unexpectedly two pairs of little egret nested with the grey herons in Sizewell Went despite the disturbance from the wind farm development.

Following the low migrant numbers in 2012 most species bounced back to their usual numbers with some species such as reed and sedge warblers well above their average for the site.

A total of 10 Biodiversity Action Plan species were recorded breeding. Sadly turtle doves were not found breeding on site for the first time a reflection of their status elsewhere in UK.

Sizewell Breeding Birds 2013									
Species	Sizewell Belts	Retsoms/ S Marsh	Leiston Common	Reckham Pits Wood	Lower Abbey Marshes	Black Walks	Field margins	Other Areas	Total
Little Grebe									0
Grey heron	3								3
Little egret	2								2
Mute Swan	3	1			1				5
Shelduck		1							1
Gadwall	5	2							7
Teal		1							1
Mallard	19				2				21
Tufted duck					1				1
Common buzzard								1	1
Sparrowhawk	2			1					3
Kestrel	1								1
Hobby		1							1
Red legged partridge		1		1				1	3
Pheasant								1	1
Water rail +	3								3
Moorhen	14	4			4				22
Lapwing		1							1
Redshank		1							1
Snipe	1								1
Stock dove	6	2	1	1		1			11
Collared dove			2						2
Turtle dove*									0
Cuckoo*	1								1
Barn owl	1								1
Tawny owl+	1								1
Little owl									0
Kingfisher	1								1
Green woodpecker	4			1					5
Gt spotted woodpecker	3	1		1				1	5
Skylark *		5						2	7
Meadow pipit		1							1
Swallow				1					1
Pied wagtail								1	1
Wren	119	17	14	7	14			2	173
Dunnock*	19	1	6	3	9			5	43
Robin	40	5	8	7	5			4	69
<i>Nightingale</i>									0
Blackbird	17	2	6	2	2	1		1	31
Song thrush*	5		1	1				1	8
Mistle thrush	1		1						2
Cettis warbler	3	2			5				10
Sedge warbler	24	4			2				30
Reed warbler	22	12							34
Grasshopper warbler									0

Lesser whitethroat	1		1				1	3
Whitethroat	8	2	3		5	3	2	23
Garden warbler	13	1	3	2	4	1		24
Blackcap	24	3	4	2	4		1	38
Chiffchaff	39	4	2		4	2	1	52
Willow warbler	5	2						7
Goldcrest	11	3	2	2	1	1		20
Long tailed tit	15	2	1	3	2	2		25
Marsh tit*	8			1				9
Coal tit	15	7	1	4		1		28
Blue tit	77	3	8	7	7		9	111
Great tit	39	3	4	7	4		3	60
Treecreeper	14			3				14
Jay							1	1
Magpie							1	1
Jackdaw							1	1
Carion crow								0
House sparrow*	2		5			6		13
Chaffinch	83	31	25	7	20	28	10	204
Greenfinch	5		4		2	1	3	15
Goldfinch	9	3	3		2	3		20
Linnet*	4		3		2			9
Siskin			1	1				2
Bullfinch*								0
Yellowhammer*	3		1				1	5
Reed bunting *	6	1			1			8
Species marked with an asterisk* = Birds with UK and Suffolk Biodiversity Action Plans								
Species marked with a plus sign + = Birds present but no accurate count made								

The WeBS counts cover both winter periods where it was notably cold for the first with much of the site frozen for most counts.

Sizewell WeBS counts 2013							
	14.01.12	11.02.12	11.03.12	23.09.12	14.10.12	11.11.12	16.12.12
Little grebe							
Cormorant					2		1
Bittern							
Little egret	2	2	2	1	2	1	3
Grey Heron	3	7	5	4	4	4	2
Mute Swan	15	7	8	11	15	6	6
Greylag goose	2	22	34		1	1	
Canada goose	2		3				
Pink footed goose					1		

Shelduck							
Wigeon		150	410		2	72	250
Gadwall	40	16	17	10	14	9	18
Teal	26	110	180	10	5	36	36
Shoveler		26	23		8	15	14
Mallard	53	120	75	61	65	70	39
Tufted duck							
Water rail	1	4	2		3		2
Moorhen	7	1	3	2	1	3	
Coot							
Lapwing		1	11			2	
Redshank		11					
Snipe	35	36	13	1	15	24	9
Jack snipe	1					1	
Oystercatcher							
Woodcock		1					
Black tailed godwit							
Curlew			3			2	4
Marsh harrier		3		1		1	2
Hen harrier							1
Sparrowhawk	2						
Kingfisher			1		1		1

The farmland winter bird counts continued. This survey began in 2001 and concentrates on the arable fields at Upper and Lower Abbey farms.

Farmland winter bird counts Upper Abbey Farm, Lelston 2013							
Species	14- Jan	11- Feb	11- Mar	23- Sep	13- Oct	10- Nov	16- Dec
Greylag goose		39				150	
White fronted goose						2	
Mallard		2					
Marsh harrier							
Buzzard						1	1
Kestrel		1	2				
Sparrowhawk		1				3	
Red legged partridge	7	7	5		17	13	32
Pheasant	13	21	19	17	26	14	19
Lapwing	37					2	
Woodcock		4					
Curlew				2			
Wood pigeon	113	739	51	47	228	800	874
Stock dove			6				

Collared dove				4			
Barn owl		1	1				
Great spotted woodpecker		1		1	1		
Skylark	31	26	21		7	38	11
Woodlark						2	3
Meadow pipit				3	8		
Pied wagtail				1	1	14	
Dunnock	1			1		3	3
Robin	2	1		2	7	3	1
Wren		2				1	
Blackbird	8	8	8	1	2	15	13
Fieldfare	1	2			4	1	
Song thrush	1					1	
Redwing					10	16	1
Long tailed tit		11		7	4	20	4
Blue tit	7	3	8	19	5	6	5
Great tit	4	2		4	3	2	1
Marsh tit		1					
Coal tit						8	3
Goldcrest							
Jay	2	1	2	2	3	5	
Magpie	3	1	1	3	2	8	6
Jackdaw	2		143	43	114	106	120
Rook	33	2	400	50	25	20	50
Carrion crow	13	18	133	62	227	26	24
Starling						32	
House sparrow		25		30	30	50	
Chaffinch	9	4		13	12	64	14
Greenfinch				1			3
Goldfinch	30		6	20	7	11	31
Linnet		18		21	7	12	
Bullfinch							
Yellowhammer	10		2			17	22
Reed bunting	12					24	18

Ringling Report EDF Sizewell Estate 2013

Bird ringing took place in two locations on the Sizewell Estate during 2013. In addition, ringing of nestlings was carried out during nest box checks around the Estate. A total of 18 Blue Tits and two Stock Doves were ringed this way.

Upper Abbey Farm. Ringing was carried out here as part of the Foraging Farmland Bird Project (FFBP). The project involves catching birds utilising plots planted with a seed mix designed specifically to grow seed bearing plants. This is the third winter of the project. A minimum of five three hour ringing sessions between November and March each winter is required. In reality, many more sessions are carried out. All birds captured are ringed or re-processed but the target species of the project are Linnet, Tree Sparrow, Yellowhammer, Reed Bunting and Dunnock.

The year began with seven sessions from the 6th January to the 21st March. Fifty two birds were either captured or recaptured during these sessions. This is an improvement over the corresponding period the previous year.

A further five sessions were possible between the 15th November and the 17th December when 118 birds were captured or recaptured including some target species Yellowhammer, Dunnock and Reed Bunting.

A change to the make-up of the seed mix used this year and a better growing season probably accounts for the increase in numbers of birds using the cover plot this autumn.

Retsom's Field. Ringing was carried out here during the autumn. The site is a small oasis of scrub and reed in the middle of open marsh and pasture and attracts both migrant and resident species. A total of 11 sessions between the 14th August and the 30th October saw 165 birds trapped and either ringed or reprocessed. By far the most numerous species was Meadow Pipit with 55 captures. Meadow Pipits arrived later this year and left sooner meaning the capture rate was down on the previous year. However, Reed and Sedge Warbler numbers were up with 30 and 10 respectively. Also of note was the capture of five Bearded Tits during their post breeding dispersal.

Sadly, there were no re-traps or controls of note this year. Longevity and site loyalty was demonstrated by a Blue Tit, L651520, ringed in January 2011 as a bird of 2010 and re-trapped in January 2013 at the cover plot.

	Ringing Totals			
	Full grown	Pullis	Recoveries	Total
Stock Dove	0	2	0	2
Swallow	1	0	0	1
Meadow Pipit	55	0	0	55
Wren	8	0	2	10
Dunnock	27	0	9	36
Robin	5	0	3	8
Blackbird	11	0	0	11
Song Thrush	1	0	0	1
Cetti's Warbler	8	0	2	10
Sedge Warbler	10	0	0	10
Reed Warbler	30	0	0	30
Whitethroat	5	0	0	5
Blackcap	3	0	0	3
Chiffchaff	2	0	0	2
Willow Warbler	1	0	0	1
Goldcrest	1	0	0	1
Bearded Tit	5	0	0	5

Long-tailed Tit	19	0	3	22
Blue Tit	28	18	9	55
Great Tit	9	0	2	11
Chaffinch	17	0	1	18
Brambling	1	0	0	1
Greenfinch	5	0	0	5
Goldfinch	4	0	0	4
Bullfinch	7	0	0	7
Yellowhammer	21	0	0	21
Reed Bunting	19	0	0	19
Annual Total:	303	20	31	354

Sizewell Estate Species Survey: White Admiral *Limenitis Camilla*

By Jamie Smith, Suffolk Wildlife Trust

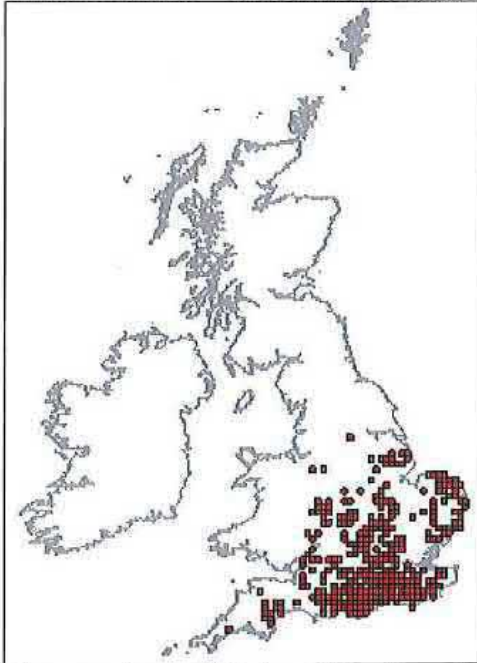
The White Admiral is a UK Biodiversity Action Plan (BAP) Priority Species.

This species is a member of the Nymphalids Family group of butterflies, which also includes the resident species: Comma *Polygonia c-album*, Peacock *Aglais io*, Small Tortoiseshell *Aglais urticae*, and the regular migrants: Red Admiral *Vanessa atalanta* and Painted Lady *Vanessa cardui*.

Range & Population

The White Admiral is fairly widespread throughout southern Britain after a rapid range expansion since the 1920s, though according to Butterfly Conservation the species has seen a sharp population decline during the last 20 years, for which the reasons are unclear. The map below shows the species current range.

White Admiral - current UK Range



Map courtesy of National Biodiversity Network (NBN)

It is thought that some colonies may have become isolated within the main part of the species range. Adult mobility has not been fully studied, but judging by the expansion during the 1920s and 1930s, it is highly possible that, given suitable habitat, an average spread of 10 km a year is thought to be possible.

Habitat Requirements

The butterfly is a woodland species, tolerant of partial shade and making use of both deciduous and mixed deciduous/coniferous woodland. It uses the edges of shady woodland and their rides, particularly where sunny glades offer an abundance of Bramble *Rubus* spp. providing a nectar source for the adults. With the sole food

plant for the species being Honeysuckle *Lonicera periclymenum*, their required habitat of choice needs a combination of both Bramble for nectar for the adults along with Honeysuckle upon which the females will lay their eggs.

On the Sizewell Estate, certain areas of Kenton Hills and Goose Hill would seem to fit the bill very well, where there are available woodland edges and shady rides, along with several seemingly suitable patches of Bramble and Honeysuckle in close proximity. Research by Butterfly Conservation has shown however, that their exact requirements may be a little more complicated.

Apparently, only Honeysuckle plants which are dangling down from trees and shrubs, in partial shade and a few metres from the edge of rides or clearings will be used for egg-laying. Honeysuckle which is lush and in open, sunny locations is not utilised for breeding purposes. The abundance of grazing and browsing rabbits and deer may also have a significant effect if lower growing Honeysuckle plants are used. For feeding, it would seem that large flower-rich, open, sunny rides and glades are the most suitable nectaring habitat for the adults.

In relation to what suitable habitat is currently available to them on the Sizewell Estate, it would seem that the White Admiral is probably fairly typical in its abundance and distribution on the site. Butterfly Conservation have said: "*White Admirals form discrete colonies within suitable blocks of woodland habitat and typically occur at low densities, with rarely more than 2 or 3 seen at a time. In woodlands with several kilometres of suitable ride edge, then up to 50 adults may be encountered*"

Sightings/Records

Possibly due to the late winter and the prolonged very cold weather, sightings for 2013 were made quite a bit later than those of the 2011 survey (between 20/6 and 19/7). The first sighting was made on 13/7, nearly 3 weeks later than 2011. This still corresponds fairly well to the published flight-period and the life-cycle of the species (see chart below).

Chart - Showing the life history & flight-period of the Adult (Imago) White Admiral (Courtesy of UK Butterflies)

	Jan				Feb				Mar				Apr				May				Jun				Jul				Aug				Sep				Oct				Nov				Dec			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Ovun																																																
Larva	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●				
Pupa																	●	●	●	●	●	●	●	●																								
Inago																					●	●	●	●	●	●	●	●																				

Butterflies were regularly seen at 6 different locations (with single sightings at 2 other locations) throughout the Kenton Hills and Goose Hill survey area (see map below). This, despite the noticeably poorer weather conditions, is an improvement on 2011 when regular sightings were only made at 4 separate locations, with single sightings at a further 2 locations. There are however, several other areas where a seemingly suitable combination of Bramble and Honeysuckle also occur. It must be bourn in mind that this year's survey was a little more comprehensive and representative of a slightly wider coverage of the forested areas.

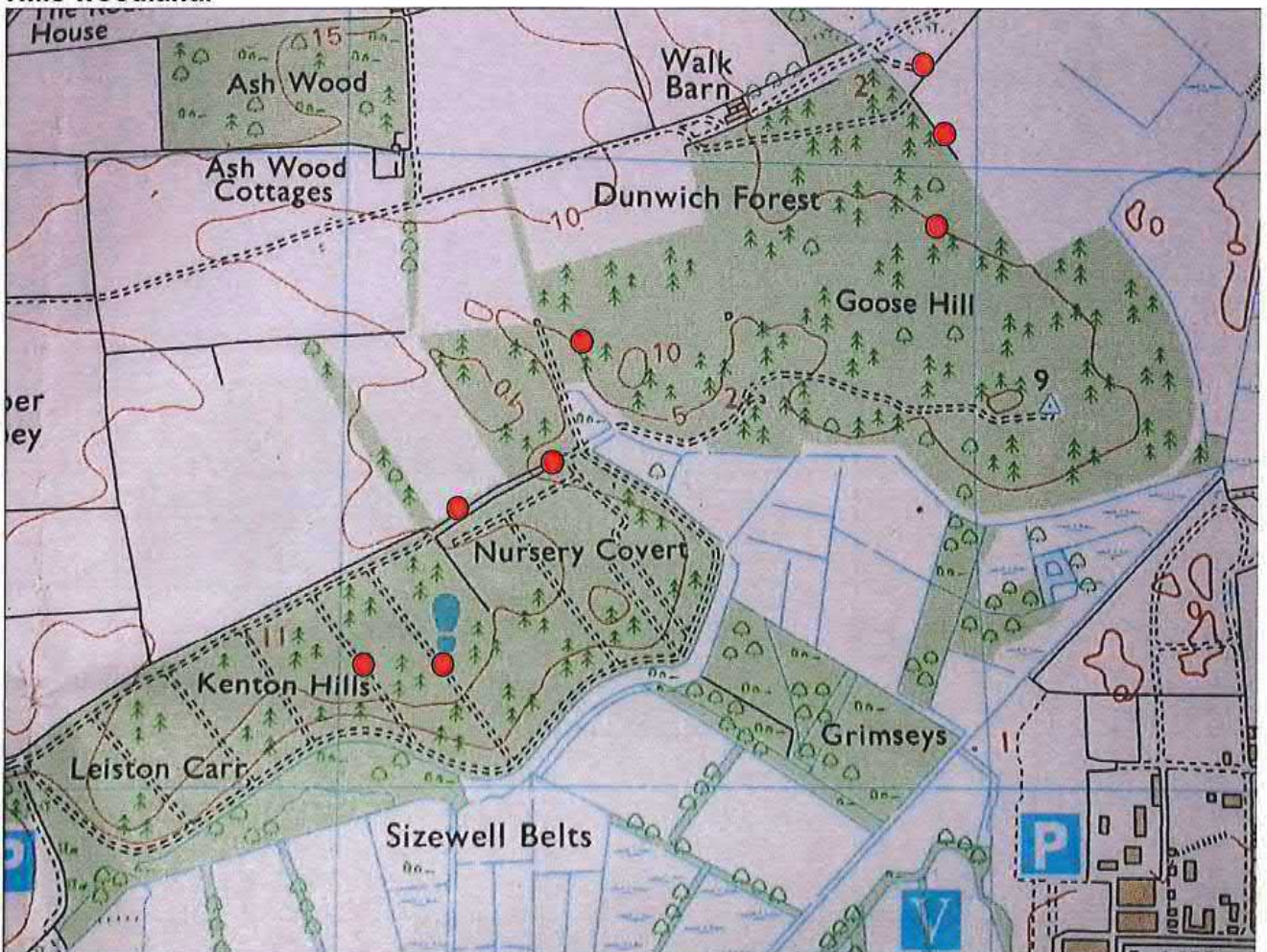
From UK Butterflies:

On emerging from the egg, the light brown larva eats the shell before moving to the leaf tip to feed. Here it feeds on each side of the midrib on which it rests, leaving the midrib intact, producing characteristic feeding damage that is quite easy to spot. The larva initially decorates itself with faeces that it uses for camouflage, although this is abandoned after a week or so, after which the larva rests quite openly on the midrib.

Toward the end of the summer after the second moult, the larva builds a winter retreat, known as a hibernaculum. This is constructed by securing a leaf to the twig with silk (so that the leaf remains attached to the food plant even after it has died), removing the edges of the leaf, and then folding what remains of the leaf edges together, forming a compartment within which the larva over-winters.

The larva emerges from the hibernaculum in the spring and, at the final moult, turns green in colour and starts to feed on the leaf edges rather than from the tip. The full-grown and exotic larva is a spectacular beast that would not look out of place in an Amazonian rainforest. It also has a curious habit of resting along the centre of a leaf with both front and back ends raised. There are 4 moults in total.

Showing the locations of the sightings of White Admiral in the Kenton & Goose Hills woodland.



4 Changes in the numbers of breeding and wintering waders and wildfowl.

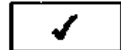
Numbers of breeding wildfowl and waders

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Little Grebe	2	2	2	2	1	1	1	1	1	0	1	0	1	0
Grey Heron	0	0	1	2	0	0	1	1	1	1	1	1	1	3
Shelduck	0	0	0	0	0	0	0	0	0	1	2	3	2	1
Gadwall	6	6	8	8	7	5	8	11	7	5	4	4	4	7
Teal	0	0	1	1	0	1	1	1	1	0	0	0	0	1
Mallard	19	17	40	37	23	28	20	24	28	15	20	17	17	21
Shoveler	0	1	0	0	3	1	1	1	0	0	0	0	0	0
Water Rail	1	1	1	1	8	1	3	6	8	0	3	1	2	3
Moorhen	26	32	29	36	51	53	31	36	45	32	34	22	13	22
Coot	3	3	1	1	2	0	0	0	1	2	2	1	0	0
Lapwing	2	1	1	1	0	0	1	1	0	0	3	1	0	1
Redshank	1	1	1	1	0	0	0	0	0	0	0	0	0	1
Greylag Goose	0	3	0	0	0	0	0	1	1	0	1	0	0	0
Tufted Duck	0	1	0	1	2	1	1	4	4	3	1	1	3	1
TOTAL	60	66	85	91	97	91	68	87	95	59	72	51	41	61



Numbers of wintering wildfowl and waders

	Peak counts on any one visit											
	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Little Grebe	1	1	1	1	2	1	2	2	1	1	1	0
Grey Heron	7	7	5	5	7	6	4	3	4	4	3	7
Mute Swan	27	21	19	17	14	12	14	11	10	10	11	15
Greylag Goose	104	104	23	172	177	95	16	152	87	87	77	34
Wigeon	350	350	30	68	75	66	27	60	36	59	11	410
Gadwall	52	59	50	36	66	97	84	54	60	19	14	40
Teal	109	148	72	72	47	54	69	117	58	52	48	180
Mallard	96	113	106	158	80	83	49	66	62	62	26	120
Shoveler	7	7	2	8	2	0	2	4	4	4	0	20
Water Rail	3	2	2	3	2	1	2	3	1	4	2	4
Moorhen	24	24	37	37	16	12	18	14	17	12	9	8
Oystercatcher	1	1	2	2	2	1	0	2	0	0	0	1
Snipe	24	24	39	39	20	3	11	21	18	10	16	36
Curlew	11	11	17	25	17	0	0	1	0	0	1	3
European White Fronted Goose	66	1	43	0	0	0	0	0	0	0	0	0
Little Egret	0	0	0	0	0	1	1	2	1	2	2	2
Barnacle Goose	0	0	0	0	0	1	0	0	6	6	100	0



Fen

1 The overall extent of fen habitat.

- No loss of fen habitat has occurred; the area remains as 2000 baseline, 7.5ha.



2 Breeding numbers of reed bunting, reed, sedge and grasshopper warbler.

Numbers of breeding reed bunting and warblers

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Reed Bunting	5	12	7	9	12	12	12	12	9	6	8	4	1	6
Reed Warbler	24	33	25	29	34	21	30	32	32	21	20	7	4	34
Sedge Warbler	16	41	35	29	34	32	21	25	23	22	10	26	6	30
Grasshopper Warbler	1	0	0	0	0	0	0	0	0	0	0	0	1	0



Lowland Heathland and Dry Acid Grassland

1 Numbers of breeding woodlark.

1999	6
2000	3
2001	5
2002	2
2003	5
2004	4
2005	3
2006	3
2007	2
2008	1
2009	0
2010	0
2011	0
2012	0
2013	0

X

2 The frequency/cover of key heathland floral species.

Vegetation surveys have been undertaken in 2000, 2004 and 2010 of the arable reversion field at Retsoms. Following sulphur treatment on part of the field as a means of reducing the pH, survey plots were established to compare the development of vegetation on the treated areas with the untreated part of the field.

The survey report concluded that the addition of sulphur and heather litter in the treated areas has produced heather-rich swards which, with the continuance of sustained management, are developing towards grass-heaths and, where building heather establishes high shade levels, into heather stands. The untreated areas, where management is coupled with summer droughting, can be expected to develop towards a grassland sward typical of dry, mildly acid conditions. SWR controlled broome in Summer 2011.

✓

Reedbed

1 Extent of reed bed.

- No loss of reed bed habitat has occurred; the area remains as 2000 baseline, ie 6.5ha.

2 Numbers of breeding reed bunting and water rails.

	Reed Bunting	Water Rails
1999	5	2
2000	6	1
2001	12	1
2002	7	1
2003	9	1
2004	12	8
2005	12	1
2006	12	3
2007	12	6
2008	9	8
2009	8	0
2010	8	3
2011	4	1
2012	1	No change
2013	8	3



Vegetated Shingle

Detailed vegetation surveys of the foreshore in front of both B and C stations were carried out in 2009 by both Entec and Suffolk Wildlife Trust. These will provide a baseline for future surveys depending upon the new build proposals.

Species

BAP Species Monitoring:

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Water Vole	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Otter	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Brown Hare	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Skylark	6	16	29	19	23	15	16	14	15	9	7	4	6	7
Grey Partridge	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Linnet	9	20	7	8	13	6	9	6	5	8	8	11	7	9
Reed	5	12	7	9	12	12	12	12	9	8	8	4	1	8

Positive Outcome
 ✓
 X

Bunting														
Song Thrush	1	3	3	3	3	1	2	4	12	6	6	6	13	8
Natterjack Toad	-	-	-	-	-	-	-	R	R	R	R	R	R	R

R = Recorded as present





SIZEWELL LAND MANAGEMENT

ANNUAL REVIEW 2011



Four spotted chaser

Photo: Carl Powell



EDF ENERGY NUCLEAR GENERATION

SIZEWELL LAND MANAGEMENT

ANNUAL REVIEW 2011

SUMMARY OF THE YEAR

- Sizewell receives Conservation award in the BTO-EDF Energy Business Bird Challenge 2010.
- Sizewell retains Wildlife Trusts Biodiversity Benchmark following surveillance audit.
- Volunteers contribute 35 person days in the management of the reedbed with reed straw used to thatch buildings at Iken's Iron Age Village.
- Natterjack toads spawn twice and successfully produce toadlets. Sizewell is now the only site in Suffolk with breeding Natterjack toads.
- Sizewell Belts SSSI assessed as being in favourable condition.
- Thinning of conifers from Great Mount Wood, Sizewell Gap and the Grove extension woodland compartments originally planted in 1998, to favour broadleaved species.
- Review of breeding bird data shows loss of 8 breeding species between 1999-2011 reflecting national declines but overall increase in number of territories.

INTRODUCTION

Carl Powell who has been one of our Suffolk Wildlife Trust wardens at Sizewell for some fifteen years, retired in March. Carl's knowledge, experience and enthusiastic commitment will be greatly missed.

Dayne West joined us as our new warden. Dayne has previously worked at Sizewell as the assistant warden, so he was welcomed back to the Estate once again.

It has now been some twenty years since the company acquired the Sizewell Belts SSSI and sixteen years since Abbey Farms was purchased. This long period of consistent management and monitoring gives us an opportunity to measure how successful we have been in conserving and enhancing biodiversity at Sizewell. The SSSI has been brought back into favourable condition whilst the review of breeding bird data is informative. It is disappointing to see the loss of 8 breeding bird species from the Estate and the gain of only two. However, all of the former species are suffering national declines, most being UK BAP priority species for that reason and so it is probable that the declines at Sizewell are more to do with factors outside of our control than the way we are managing the Estate. However, it is hoped that as EDF Energy moves forward with new nuclear build, this may provide opportunities for habitat enhancement for some of these species.

SIZEWELL RECEIVES CONSERVATION AWARD IN THE BTO - EDF ENERGY BUSINESS BIRD CHALLENGE 2010

The BTO-EDF Energy Business Bird Challenge 2010 award ceremony was hosted at Heysham Power Stations Nature reserve in June. Sizewell was delighted to receive the Conservation award in the Power and Industry Companies >95ha category for all of the land management work for biodiversity on the Estate.

The final bird count for the site was a rather disappointingly average total of 149, but included a number of highlights including waxwings, a Pallas' Warbler, a King Eider, a Wryneck and a Corncrake.



BIODIVERSITY BENCHMARK

The second surveillance audit was undertaken in the summer of 2011 and Sizewell successfully passed the audit and retained its certification. The Wildlife Trust auditors have extended the compliance audit interval to every 2 years, as they are sufficiently confident in the company's biodiversity management system to not require annual surveillance audits.

The Biodiversity Benchmark demonstrates that the Sizewell Estate continues to satisfy the scheme's rigorous criteria for managing the site to protect and enhance the habitats for native plants and animals, within any operational constraints.

SIZEWELL BELTS SSSI AND LOWER ABBEY MARSHES

Sizewell Belts

The year began as 2010 finished, with cold wintry weather and a prolonged period of frost and snow. Only 524mm of rain was recorded for the whole year, and 2011 proved to be the driest year for many years at Sizewell. Although low annual rainfall can cause problems for wet grazing marshes, one advantage of the dry weather over summer was that all of the grassland topping was completed

Several gateways to the marshes were rebuilt including the main access bridge onto Goose Hill Marsh using new sleepers and the replacement of the gate and wing fencing. A new gateway and culvert was constructed below Reckham Pits Wood, to allow easier access onto the marsh and to reduce the amount of poaching by cattle.

Several willows and alders that had collapsed or had fallen into the dykes were cleared away whilst a further willow was re-pollarded and a third willow pollarded for the first time. Scrub vegetation was also removed from the dykes' sides in preparation for the dyke slubbing and ditching work undertaken by contractors.

The orchid meadow was cut for hay and the aftermath was grazed. Most of the path cutting on the marshes took place in the latter part of the year due to another late end to the growing season.

The Sizewell Belts Management Plan was reviewed and updated

Lower Abbey Marshes

A Green Team from UK Power Networks spent a day clearing mature gorse on Lower Abbey Marshes. The low annual rainfall resulted in the Minsmere River/New Cut water level being very low all year which made keeping cattle confined to an area of the marsh difficult as the river no longer functioned as a barrier to cattle movement.

Reedbeds

The dyke slubbing and ditching contractors improved the entrance to the reedbed so that machinery could once more access the area. The entrance had been destroyed by deer repeatedly crossing the dyke and reducing it to a deep muddy morass.

A substantial area of reed was cut this year with help from a variety of sources. On one occasion a team of 15 people from the Suffolk Wildlife Trust Community Team worked for two days to cut and clear reed. The residue and all unwanted material was then burnt by site staff, over the following few days. Help with reed cutting also came from the County Archaeology Unit who provided a work team to cut reed for use recreating an Iron Age village at Iken. The reed will be used by school children

to help thatch one of the village building's roofs. The same team returned in November and helped cut another large area of reed which was collected and bundled as it was cut, and three large van loads of reed went off to the Iron Age village for use in thatching further recreations of iron - age buildings. Following the Archaeologists, a Green Team from the Environment Agency worked in the reedbeds and helped clear a huge area of mature willow scrub.



Sizewell reed being used to thatch an Iron Age dwelling at Iken (Photo: Duncan Allen)

HEATHLAND

Leiston Common

The grazing of the heathland by the flock of Hebridean sheep continued to have a positive impact on all the heathland areas. However following the unfortunate death of 7 sheep from attack by dogs in December 2010, and the loss of another sheep on Leiston Common in July 2011, the decision was made to remove sheep off the Common and graze with Exmoor ponies instead. So far this has been effective and the four ponies have coped with occasional dog problems and are grazing the area adequately.



All of the bracken areas were cut using a flail mower and Retsoms and Leiston Common were topped to control ragwort.

Retsoms

Retsoms was topped to control ragwort and sheep grazing through winter and early spring has continued to reduce the ragwort problem. The natterjack toad pond was pumped dry in the winter to reduce the number of predators and then allowed to refill naturally with rainfall. The pond was covered with netting to protect the tadpoles from predation in early spring as soon as spawn was recorded. The toads spawned for a second time in July, which is the first time this has occurred at Sizewell. On each occasion toadlets emerged successfully.

SIZEWELL FORESHORE

The interpretation board at the Beach car park disappeared and a replacement has been sourced and will be erected in 2012. The temporary fence was again erected in the spring, which helped prevent trampling of the shingle flora, and resulted in a good display of both sea pea and sea kale.

There were quarterly meetings of the Sizewell Shoreline Management Group looking at the affects of coastal processes and monitoring the changes. The northern section on the shoreline continues to erode. The annual beach meeting with Leiston Town Council was attended by Alan Miller and Dayne West of the Suffolk Wildlife Trust.



The beach flora gave a good display within the fenced area (Photo: Carl Powell)

WOODLAND MANAGEMENT

Maintenance of Existing Woodlands and Plantations

A premature thinning was undertaken in Great Mount Wood, Sizewell Gap, and the Grove Extension, to remove any conifers impeding the development of the broadleaved trees. These three woodlands were planted in 1998 with a mixture of native broadleaved trees and conifers, reflecting the composition of local woodland, with the conifers occupying no more that 40% of the total planted area. The faster

growing conifers had out competed the native oaks and ash trees and were therefore selectively felled to reduce the competition with the broadleaved trees. The Forestry Commission granted consent for the thinning work, which was considered to have no economic value, and grant aided part of the work under the English Woodland Grant Scheme.

Deer Management

The objective of deer management on the Estate is to reduce the impact of deer damage to woodland and crops to acceptable levels. The impact of deer damage to trees and crops is managed by using a combination of measures to protect the trees and crops from direct damage, and to reduce the local deer population. The protection of high value crops such as field scale carrots is achieved using temporary electric deer fencing erected around individual fields to exclude deer. The protection of young trees is achieved by individually protecting the trees in tree tubes or by deer exclusion fencing.

The deer population is controlled by culling, and there were 39 deer culled on the Estate this year, comprising 8 Muntjac and 31 Red deer.

Deer management is carried out in consultation with the Deer Initiative, and an open day was held in spring which was well attended, and discussed issues of deer damage to crops and habitats, and control both on the Estate and at Minsmere.

Kenton and Goose Hills Woodland

The two compartments in Goose Hill that were felled and restocked in 2008 were initially planted with solely Scots pine, rather than a mixture of Scots pine and Corsican pine, to limit the exposure to red band needle blight at the request of the Forestry Commission. Unwanted Corsican pine is regenerating within both restocked compartments and has been controlled by flailing between rows, but will also have to be controlled by herbicide weeding along the rows.

The rhododendrons north of the southern ride in Kenton Hills were controlled by cutting and flailing to limit the area they occupy to the wetter edge of Leiston Carr woodland. The fire pond in Leiston Carr had become overgrown and so was cleared and the pond siltings removed using a digger working from the cleared area. This is to ensure sufficient available water and easy access in the event of a fire.



Tree Risk Identification and Management

Regular assessments of the condition of the trees on the estate are undertaken and a group of elm trees were identified as potentially hazardous and a recommendation was made to cut down the trees to reduce the risk to users of the estate.

No tree management work has taken place as they were also recognized as having the potential to support bat roosts and it was decided to postpone work until a survey of the trees was carried out to establish the actual bat potential of the trees. A bat survey of the trees was undertaken and the survey recommended that the trees should be coppiced by soft felling immediately. The survey also recommended that all work should be supervised by a suitably qualified or experienced ecologist and that no work should take place until the course of action had been discussed and agreed with Natural England.

Trees in the red zone were surveyed and work was undertaken to a number of trees including the large Monterey pine by the District Survey Laboratory. The Monterey Pine suffered damage to its crown from strong winds that left the tree in a hazardous condition with large broken branches within falling distance of the main access track. The remedial work to remove all damaged branches and rebalance the crown was undertaken at the first opportunity using a mobile elevated working platform.

ABBEY FARMS

Farm Buildings

Repair work to the farm buildings on the Estate included the partial re-cladding of the main thatched barn at Upper Abbey Farm and repairs to rainwater goods to the buildings at Lower Abbey Farm as well as replacement of some of the tin roofing sheets on the large timber framed barn. The roof and unsafe walling to the old pig shed were removed as the building was no longer safe and represented a possible safety risk.

The area around the thatched barn at Upper Abbey was cleared of brambles and other vegetation to allow access for the contractors. Because of the known use of the building by bats, the areas of the barns for repair were thoroughly checked for bats prior to work starting and a method statement was agreed with Natural England. On removing a piece of old weather boarding, two bats were discovered by the builders and were placed in a bat box within the barn by a licensed bat worker but had removed themselves before their identity could be verified a couple of hours later. Natural England were informed that bats had been disturbed and were satisfied that the action undertaken was in accordance with the approved method statement. A Kent type bat box was constructed and fitted on the back of the barn where the two bats were first encountered.



Winter Bird Feed Crop

The wild bird seed mixture plot at Upper Abbey farm was manured and ploughed in spring although the ground was so dry that the plough would not penetrate until it had been broken up with a cultivator. The wild bird seed mixture was drilled on 1st June and it rained following a prolonged period without rain on the following day. This was the first rainfall for nearly three months, and subsequent warm wet weather enabled the crop to establish and the yield was as good as in previous years, despite the low rainfall and late drilling date. The 6 m wide grassy arable field margins were managed by flailing off the 3 metres adjacent to the crop and leaving the remaining 3 m uncut.

The Suffolk Wildlife Trust hedge flail was used to cut the hedge on both sides along the entrance track to Upper Abbey Farm.

COMMUNITY

Green Teams from the Environment Agency, UK Power Networks, and the County Archaeology Unit volunteered their time to help with management of the reedbed habitat.



A well attended guided walk was organised for the local Suffolk Wildlife Trust group, with the objective of spotting autumn migrant birds.

A fungus foray was held in Kenton Hills as part of Suffolk Coastal District Council Woodwose Festival, and attracted over 70 people. Unfortunately the dry weather meant that fungi were difficult to find. The Suffolk Wildlife Trust Mammal Group held a badger surveying training day at Upper Abbey Farm. Dayne West gave a talk to the Southwold Suffolk Wildlife Trust group.

SIZEWELL NEW BUILD REPTILE HABITAT CREATION

Kenton and Goose Hills Woodland

Compartment 2g in Kenton Hills (3 ha) was clear felled and all of the timber removed from the site. The lack of FSC certification of the timber caused some difficulties at

the sawmill, but additional information was sent to the FSC auditors explaining the management of the woodland in greater detail. FSC certification is unfortunately not possible for the conifer woodland due to operational constraints. Following the timber clearance work, the site was mulched by Practicality Brown in mid March and was subsequently cultivated to remove ruts, heaps, and hollows, which will allow the heathland habitat to be more easily managed in the future. The clear felled compartments 2g and 2a were both sprayed with Asulox for bracken control.

Compartment 2a, the earlier clear felled compartment, was contained within reptile exclusion fencing erected in October by Legacy Habitat Management. The reptile fencing will ensure no reptiles move into the new area of habitat until we are ready to translocate them from the new build development site.

St James Covert



The young broadleaves (mainly oaks) were lightly thinned to break up the uniformity of the plantation areas. The rides and the clear felled open areas were flailed and strimmed throughout the growing season to suppress the bracken and brambles, and encourage a more acid grassland/heathland ground flora to develop. The open areas were contained within reptile exclusion fencing erected in October. The areas of new habitat have developed extremely well and are almost ready to receive

translocated reptiles now.





Estate Ex-arable Land, Part Rosery, White Gates and Red Rails Fields

The grassland areas were mown three times using the new winged topper to encourage the grasses to tiller and reduce the thistle growth. The ploughed perimeter strip was rotovated to kill off thistles. A total of 24 'tins' have been put on the trial plots to monitor reptiles, and to date only field voles have been found. White Gates and Red Rails fields were fenced on the field boundaries with reptile exclusion fencing in October.

SIZEWELL NEW BUILD HEATHLAND CREATION TRIAL

A new trial was established in 2011 to evaluate the use of elemental sulphur for soil acidification prior to heathland creation at Sizewell. The trial was established on land adjacent to the northern end of the existing peat experiment within the existing rabbit proof fenced area.



The objectives of the trial are to determine the optimum rate of elemental sulphur application that will result in sufficient soil acidification for the establishment of heathland vegetation, and to evaluate the impact of soil acidification with elemental sulphur on drainage water quality.

The grass cover was sprayed off with herbicide in August 1 and the soil cultivated prior to sowing with a grassland mixture in autumn. The 4 treatments are replicated 3 times on small plots measuring 6m x 10m resulting in 12 plots in total. Ground water monitoring equipment was installed, and surface and groundwater monitoring began when the soils reached field capacity.

SIZEWELL NEW BUILD SITE INVESTIGATION WORK

As part of the site investigation works an archaeological survey was carried out by Amec Geo-archaeological/University of Wales (UWLAS). Before the survey could

proceed within the wooded areas, all trees and other vegetation was cleared by contractors to enable access to the working areas for the surveyors. The work involved the clearance of ground vegetation including small trees, and shrubs, followed by the grinding out of all tree and shrub stumps.

The environmental impact of the clearance work was kept to an absolute minimum by carefully planning the timing and stages of the work, and all operations were undertaken under the supervision of an ecologist. The vegetation clearance work started in February and was completed in early March to minimise the impact on nesting birds and other wildlife.

BIODIVERSITY MONITORING

Plants

Fen Meadow monitoring

The fen meadow-monitoring programme entered its fifteenth year. A number of quadrats have been set up and are visited every two years on a rolling programme of visits. Changes are recorded and the results related to either management or natural fluctuations. A full report has been produced by Jonny Stone of OHES Environmental.

The summary for the 2011 survey is as follows;

1. This report for contract no. TCC 867/11 refers to survey work carried out on 17th and 18th July 2011 as part of the Sizewell Belts Fen Meadow Vegetation Monitoring Programme, initiated in 1995. The report incorporates fieldwork data from six permanent vegetation plots, located in site compartments G4, G34, G38, G50, G59, M7 and M9, into the existing framework for reporting.
2. The methodology follows agreed amendments (Stone 2005) to the original contract specification (Parmenter 1997), and the report includes a partial SSSI condition assessment form, which will be combined with the following year's survey to contribute to Natural England's condition assessment of the SSSI wet grassland interest feature.
3. The 2011 survey was carried out following several weeks of showery weather after an extended drought period. The ground conditions were at least damp, but with only localised ponding of rain water. As usual there were no impediments to surveying, which was conducted prior to hay cutting.
4. In terms of species composition, all plots recorded comparable numbers of species to recent years, with several new records for particular plots. In the fen meadows, Velvet bent *Agrostis canina* continues to appear in plots, while in Compartment M7, the reedfen species compliment is enhanced with new records for fen species, including Marsh Stitchwort *Stellaria palustris*. Elsewhere, Southern Marsh Orchid *Dactylorhiza praetermissa* has returned to plot M9.
5. The biannual SSSI condition assessment for 2011 shows strongly favourable sward composition, and continued improvement in sward structure. Therefore it is judged to be in a Favourably Maintained condition
6. The report recommends the need to continue the current intensity of management, particularly to maintain the ideal summer conditions achieved by the combination of the stocking regime and supplementary management i.e. hay cutting and topping.

Fungi

The dry weather was not conducive for providing a good show of fungi although there was a good turn out for the fungus foray. It was during that event that we learned of a rare fungi that had been found on site in 2004 and the record had failed to reach us. Sizewell is one of only two sites in Suffolk where the fungi *Leucocoprinus georginae* has been found. According to the latest map on the NBN Gateway there are only 18 locations on the UK. It would appear to be closely associated with bracken and birch so may well be over looked

Invertebrates

Butterflies

SWT volunteer Trudy Seagon set up butterfly transects along the Upper Abbey Farm field margins in 2004 and has repeated the survey annually since that time. A total of 22 species were recorded in 2007 the same as 2006. This is probably the peak species count having started with 19 species in 2004. The 2008 survey reflected the weather with only 16 species recorded and a total of 336 individuals compared to 1591 in 2007. The 2009 season was a great improvement with a dry summer contributing to a species total of 20 and 1889 individuals, the highest individual total since the survey began. In 2010 the numbers recorded dropped back to the 2007 level with 1537 individuals recorded however the species count increased by two to 22 equalling the previous best counts.

The total number of individuals increased to an all time high in 2011 with 2094 butterflies seen over 24 visits however only 16 species were recorded

Details are in the Appendix:

Dragonflies

Norfolk hawkler: Adults and teneral (freshly emerged insects) seen in good numbers on the Belts

Banded Demoiselle: Seen in small numbers at two places on site. On Lower Abbey Farm marshes along the main Minsmere River and on Goose Hill marshes along the Leiston Beck.

Emerald Damselfly: Seen in small numbers on Goose Hill marshes.

Large Red Damselfly: Common around the site.

Azure Damselfly: Very common on site.

Blue-tailed Damselfly: Common on site.

Small Red-eyed Damselfly: Now common on site

Southern Hawker: First seen between Goose Hill and Salt Marsh on 22 July.

Migrant Hawker: Common on site

Moths

The Suffolk Moth Group held a trapping session on 4th June.

Ant lions

The number of pits varies from year to year with weather and vegetation growth however the work carried out in 2007 proved beneficial. The 2008 count was 123 pits in the cattle yard and 89 in the new area outside. This was low compared to the peak count of 900 in 2004 but weather conditions and rabbit activity were the likely limiting factors. The 2009 survey showed an overall increase with 377 pits in the cattle yard and 105 pits in the new area. The dry early summer in 2010 proved productive with a total of 1032 pits, the highest figure since the colony was discovered. The colony continued to expand with a slight increase of 1100 pits in 2011. Rabbit activity continues to make monitoring difficult with the ground being constantly disturbed.

Mammals

Harvest mouse

Having found a harvest mouse nest in the reedbed in 2009 another recent nest was found when reed cutting this winter proof that there is a population on site.

Otters

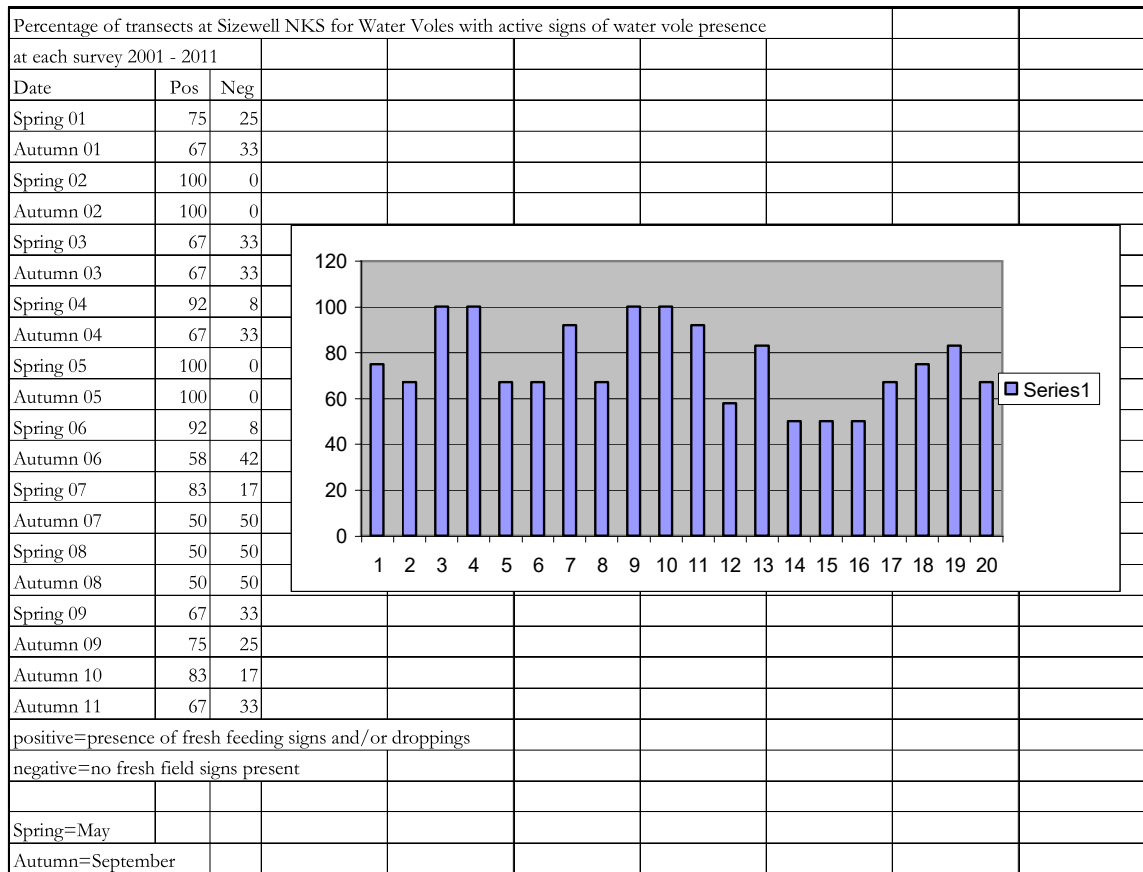
Spraints and foot prints were regularly found throughout the Belts indicating a year round presence, there was one sighting in 2010 on Goose Hill Marsh on 9th March.

Badgers

The original sett in Ash Wood continues to expand with several out lying holes dug throughout the wood and a second large sett is regularly occupied on the north side of the central ride. The animals have continued to expand their colonisation and additional setts have been appeared around the Estate including one in the pit beside Upper Abbey Farm. Entec surveyors have been bait marking to try and establish the various groups territories.

Water voles

The National Key Site monitoring programme continued with just autumn surveys as per the Royal Holloway College recommendations.



The 2011 survey was as predicted and the numbers increased showing cyclical population changes commonly found in all vole species when in a stable environment with no predation by mink. The requirement for UK analysis is now just one survey per year in the autumn, when the peak number of voles are present due to juvenile recruitment.

Bats

Monitoring for barbastelles was again carried out using static detectors and some transect walks by Entec surveyors. The natterers bats were very evident in the barn again with droppings distributed all over our machinery. The annual bat box check in Kenton Hills was carried out in October. Unusually no pipistrelles were found though fresh droppings in 4 boxes indicated they had been present recently. Male Noctules were found in two boxes and for the first time natterers bats were found to be using two boxes one containing 6 animals.

Deer

Regular counts were made of red deer and muntjac throughout the year. No other species were recorded.

Reptiles and amphibians

Natterjack toads

Following the creation of two ponds on Retsoms in 2004 specifically for natterjack toads a three year introduction programme started in 2005. Tadpoles were brought from Holme NNR in Norfolk and released into both ponds and this was repeated in 2006. One pond has a butyl liner and the second was constructed using bentonite clay. The bentonite clay pond has proved to be problematic and now no longer holds water. The butyl lined pond continues to function well and is pumped dry each winter to remove potential predators (water beetles and dragonfly larvae) and allowed to refill naturally with rain water. A permanent low fence was installed around the pond in 2009 and has allowed for improved protection supporting lengths of garden netting to prevent avian predators gaining access to the pond perimeter. The toads spawned in 2010 with some 2500 tadpoles seen feeding however no toadlets were known to have emerged but at least the adults appear to have survived the cold winter. Following a second consecutive cold winter 2011 proved to be the best ever year for the toads. The first strings were laid in April from which toadlets emerged and a second spawning occurred in late July resulting in yet more successful metamorphosis. This was despite the attentions of an ever present grass snake.



Juvenile natterjack toad

Photo: Dayne West

Reptiles

No specific surveys were carried out this year. An adder was found basking in the door way of the workshop at Upper Abbey Farm on 20th April. A number of survey 'tins' were placed in the reptile mitigation areas to check that no animals were currently present now the exclusion fences are in place.

The first grass snake of the year was seen on 22nd March. An individual was regularly seen in and around the natterjack pond.

Sizewell Bird Report 2011

The details of the breeding and wintering surveys are to be found at the end of this report.

The following is a list of birds recorded on the estate during the period of this report but only refers to significant species and is not a total species list.

Systematic list;

Bittern	A bird was heard booming in the reedbed on 13 th April
Little egret	This species is now regularly seen on the estate.
Grey heron	Birds are present throughout the year. A single pair again nested in Sizewell Went
Gadwall	Four territories were located the steady decline is mirrored nationally.
Red Kite	Three spring sightings of single birds 22 nd March, 11 th April & 7 th May
Hen Harrier	Ringtails were recorded on 20 th Feb & 22 nd March
Common Buzzard	Birds are seen all year round now with a maximum of 5 over Broom Covert on 3 rd May.
Hobby	First returning bird was seen on 25 th April. One pair held territory on the estate
Lapwing	A flock of 120 birds were seen on Retsoms on 14 th March
Turtle dove	First returning bird recorded on 4 th May. Only one territory was recorded on site
Short eared owl	A single bird was present on 21 st April
Cuckoo	Only one territory was located on the estate
Woodlark	The decline of this bird continues with no birds recorded holding territory on the estate for the past three years.
Skylark	Only 4 territories were found but the survey was incomplete as not all of the arable land was surveyed however this does indicate a continued decline.
Nightingale	Two birds held territory
Black redstart	Two pairs are thought to have bred within the power station fences.
Wheatear	Several birds recorded on spring passage beginning on 13 th April with birds returning from 5 th Sept when 2 were present.

Cettis warbler	23 territories were found a continued increase despite the harsh winter
Willow warbler	A welcome increase with 5 territories recorded compared to just one territory in 2010
Marsh tit	A continual increase in numbers with 6 territories located this species is bucking the national trend at Sizewell
Reed bunting	Only 4 territories located compared to a peak of 12 in previous years but this mirrors the national trend.

Summary

The key areas of the estate are surveyed during the breeding season using the BTO's Common Bird Census method of mapping all territories with the exception of the field margins which are treated as transects as in the BTO's Breeding Bird Survey methodology

The number of breeding species recorded in the survey areas totalled 62, still above the sites average over the past 13 years. Casual recording around the remainder of the estate brought the figure up to 65 species, which included house martin, black redstart, and kittiwake.

A total of 12 Biodiversity Action Plan species were recorded breeding. 2011 saw increases in marsh tit, house sparrow and yellowhammer but declines in skylark and reed bunting. The absence of set a side is a likely cause with regard to skylark, but for reed bunting the problems lie elsewhere

The WeBS counts cover both winter periods where it was notably cold for the first with much of the site frozen for most counts. Most notable was a count of 100 barnacle geese which were accompanied by 4 red breasted geese, again a site record, but their origins are likely to suspicious. There is a large local population of feral barnacle geese which are joined sometimes by genuine wild birds, the provenance of the red breasted geese is also unknown.

The farmland winter bird counts continued. This survey began in 2001 and concentrates on the arable fields at Upper and Lower Abbey farms. Obviously the cropping and stage of cultivation influences some of the results but already a number of trends are showing.

For the first time no woodlark were recorded however 250 linnets in November were a welcome sight.

Sizewell Breeding Birds 1999 2011

Losses and Gains over 13 years at Sizewell

Breeding bird surveys have been undertaken on parts of the Sizewell Estate since 1993. In that time the estate has grown in size from initially comprising of just the A & B sites and Kenton & Goose Hills to the present 821 hectares of land consisting of the former Sizewell Hall estate including Sizewell Belts and also Upper and Lower Abbey Farms.

The total area has now remained unchanged since 1995 when the Upper and Lower Abbey Farms were purchased. Whilst the Belts have always been systematically recorded other areas have gradually come into the surveying programme and so to provide some meaningful long term data for the purpose of this report we have used 1999 as the start point. Since then all the recording has been standardised and consistent and so year on year comparisons can be made. There are still some species which occur but do not get regularly recorded such as house martins on some of the buildings and the black redstart nesting around the power stations.

The results are in the appendix and show how over time the fortunes of the various species fluctuate. Within the table is the current national status of each species, i.e. declining, declining by >25%, >50%, stable or increasing. Of the total number of

species found breeding on the estate 39 are in national decline in varying degrees. Water rail and tawny owls are not surveyed annually and so yearly comparisons cannot be made, however it is considered that both species survive in stable populations.

The overall number of species breeding annually varies between 57-67 but overall the number of territories has increased which probably points to an general improvement in habitat across the estate.

Some 80 different species have bred over the 13 year period, in that time eight species have been lost as breeders and only two new species added.

Species lost;

Shoveler
Grey partridge
Ringed plover
Redshank
Lesser spotted woodpecker
Woodlark
Grasshopper warbler
Spotted flycatcher

Species gained

Collared dove
Cettis warbler

Declining species

Pheasant
Skylark
Garden warbler
Sedge warbler
Willow warbler
Coal tit
Linnet
Yellowhammer

Increasing species

Robin
Song thrush
Long tailed tit
Chaffinch
Greenfinch
Goldfinch

Species breeding sporadically

Oystercatcher
Lapwing
Stonechat

Overall the trends on the estate mirror national trends which, leads to conclude that much of the declines are subject to external forces beyond the control of localised management. However a reduction in the intensification of the arable farming could increase skylark numbers and some other farmland birds. Decreasing the areas in arable production over the next few years should have some positive effect.

RINGING REPORT SIZEWELL ESTATE 2011

It has been a mixed year weather wise for ringing on the Sizewell Estate with adverse weather conditions restricting ringing activities much of the time. However, ringing did take place at three locations at appropriate times of the year.

We are also involved with both the Suffolk Community Barn Owl Project (SCBOP) and the Foraging Farmland Bird Project (FFBP). Barn Owls returned to breed in the pole box on Goose Hill Marsh after missing out to both Kestrels and Jackdaws in previous years. Two chicks were hatched one of which was ringed, the other being too small at the time to ring. Other barn owl boxes on site were occupied by Stock Dove and two chicks were ringed in Lower Abbey Farm barn and a single chick in a box located on a pollarded willow adjacent to Lower Abbey yard.

The FFBP is a four year project by Suffolk Wildlife Trust and the Waveney Bird Club. Farms from all over Suffolk are taking part. The purpose is to determine the use of

cover plots by wintering birds with special emphasis on four threatened species, Reed Bunting, Linnet, Tree Sparrow and Yellowhammer. Cover plots are areas sown specifically with a seed mix designed to provide cover and food during winter months when feeding opportunities for wild birds are at the lowest. The project started this winter and involves at least one three hour ringing visit per month from November to March. We will be taking part in the Project using the cover plot at Upper Abbey Farm.

The year began with ringing on the Upper Abbey Farm wild bird cover plot. Between 11th January and 7th March 2011 a total of 92 birds were processed, 77 new birds, 14 re-traps and 1 one control. Highlights of this first period included catching 25 Yellowhammers, 17 Chaffinches and a Kestrel.

Autumn ringing at the cover plot saw the start of our involvement with the FFBP. Ringing took place from 8th November to 30th December 2011. A total of 151 birds were processed, 129 new birds, 21 re-traps and one control.

Ringing in the reedbed took place between 14th April and 11th May 2011. Sadly, after one expensive 60 foot mist net was ruined, it was decided to abandon this site due to the presence of a number of Red Deer. Only 11 new birds were processed during three visits. This included three Cetti's Warblers.

Retsom's field is the autumn site and usually attracts both resident species and migrants. A total of 102 birds were processed between 14th September and 17th October 2011. 96 new birds, 4 re-traps and 2 control's (same Cetti's Warbler twice!) Bulk bird here was the Meadow Pipit with 44 new birds ringed. 17 migrant warblers of four species and a single Whinchat were also of note.

A record of birds re-trapped during the year shows that although many birds of those species re-trapped remained loyal to the original ringing site there is evidence of movement over a wide area between the RSPB Reserve at Minsmere, Sizewell Estate and the town of Leiston. Two records of a Cetti's Warbler and a Blue Tit need confirmation of original ringing details from the British Trust for Ornithology but they were undoubtedly ringed at Minsmere during the summer.

Longevity was demonstrated by the following records:

Blue Tit	V860157	now 4 years old
Great Tit	T698584	now 5 years old
Chaffinch	T383866	now 6 years old
Reed Bunting	T383729	now 7 years old

RINGING TOTALS SIZEWELL ESTATE 2011

Species	Adult	Pulli	Control	Total
Kestrel	1			1
Stock Dove		3		3
Barn Owl		1		1
Great Spotted Woodpecker	1			1
Meadow Pipit	44			44
Dunnock	24			24
Robin	6			6
Whinchat	1			1
Stonechat	2			2
Song Thrush	3			3
Blackbird	20			20
Whitethroat	2			2
Sedge Warbler	4			4
Cetti's Warbler	8		1	9
Reed Warbler	8			8
Willow Warbler	2			2
Chiffchaff	8			8
Goldcrest	2			2
Firecrest	1			1
Wren	7			7
Great Tit	30			30
Coal Tit	1			1
Blue Tit	33		2	35
Marsh Tit	1			1
Long tailed Tit	12			12
Treecreeper	1			1
Chaffinch	52			52
Brambling	1			1
Goldfinch	2			2
Greenfinch	9			9
Reed Bunting	3			3
Yellowhammer	25			25
	318	4	3	325

RETRAP HISTORY UPPER ABBEY FARM 2011

Birds ringed/recaptured by Carl Powell/Alan Miller

SPECIES	RING NUMBER	AGE/SEX	DATE	PLACE
Kestrel	EW98083	Pulli	28.06.2010	Oakley, Suffolk
		Found dead	17.08.2010	Sizewell
Jackdaw	EW64177	Pulli	10.06.2010	Sizewell
		Shot	28.05.2011	Henstead Suffolk
Cettis warbler	L348413	3J	29.07.2010	Minsmere
		Controlled	03.10.2011	Sizewell
Blue tit	L276565	Pulli	24.05.2010	Sizewell
		Controlled	25.08.2011	Minsmere

The above are birds ringed at Upper Abbey Farm or else where on the Estate which have been recaptured on site with the exception of the kestrel.



Water rail Photo: Carl Powell

APPENDIX

Sizewell WeBS counts 2011

	17.01.11	14.02.11	14.03.11	17.10.11	23.11.11	19.12.10
Little grebe				0	1	0
Bittern	1					
Little egret		1	2	1	0	0
Grey Heron		4	2	0	0	1
Mute Swan	1	8	6	11	7	7
Greylag goose		2	27	0	0	77
Canada goose			5			
Barnacle goose				0	0	100
Red breasted goose				0	0	4
Wigeon		59	41	0	2	0
Gadwall	9	19	4			14
Teal	12	39	35	0	19	14
Shoveler			2			
Mallard	18	36	22	5	15	15
Tufted duck			4			
Water rail		4	2	1	1	0
Moorhen	4	10	6	2	6	9
Coot			3			
Snipe	8	8		0	9	5
Woodcock		1				1
Curlew				0	1	0
Marsh harrier				1	3	0

**Farmland winter bird counts Upper Abbey Farm
Leiston 2011**

Species	17- Jan	14- Feb	15- Mar	01- Nov	19- Dec
Canada goose	64				
Greylag goose	245	68			
Barnacle goose	23				
Mallard			2		7
Teal			1		
Marsh harrier			1		
Red legged partridge	6	4		19	8
Pheasant	17	7	17	30	25
Moorhen					
Lapwing			4	10	
Oystercatcher			1		
Woodcock		2			
Jack snipe				1	
Black headed gull			27		
Wood pigeon	9	36	9	480	47
Stock dove			3	1	
Green woodpecker		1			
Skylark	6	16	1	74	27
Meadow pipit				50	
Pied wagtail		2			
Dunnock		2			1
Robin	1	1			1
Wren		1			
Blackbird	4	2			18
Song thrush		2			
Redwing					3
Long tailed tit		2			
Blue tit	3	1			
Great tit		8			
Coal tit		1			
Magpie	8	20	19	12	3
Jackdaw				260	
Rook			80		17
Carrion crow	3	7	13	320	15
Starling		20		150	
House sparrow		15			
Chaffinch	15	13	15	52	6
Goldfinch			13	35	
Linnet		13		250	
Bullfinch	1				
Yellowhammer			10		

Upper Abbey Farm Butterfly transect summary 2011

Sum of No. Seen	Date																							Total	
Species	6.4	11.4	20.4	28.4	4.5	12.5	19.5	25.5	2.6	9.6	14.6	20.6	27.6	5.7	11.7	19.7	28.7	3.8	9.8	17.8	21.8	1.9	5.9	13.9	Total
Brown Argus														1	2				1	1					5
Comma	1	3												2					1				2	2	11
Common Blue																		1					1		2
Gatekeeper														2	3	13	32	36	34	19	13	1			153
Grayling																	2	1							3
Green-veined White			2	2	3	7	4	3	1		1	3	7	16	4	12			3	17	9	5	1		100
Holly Blue		2			1	1												1			3	1			9
Large Skipper								1	1		2	1	5				2								12
Large White						3	8	2	1			3	3	1	8	14	15	4	2	3	3	2	1	3	76
Meadow Brown								3	2	29	45	48	81	103	81	64	34	31	15	5	4				545
Orange-tip		1	3	2	5	1	1																		13
Painted Lady												1											1	2	4
Peacock	5	4	2			2											4	3							20
Red Admiral				1			2			1	1	1	2	2	3	3	6	4	4			17	45	89	181
Ringlet												3	19	101	87	59	14	4	2						289
Small Copper							1				2	4	3	9	10	3	2	1	2		2	1	1	1	42
Small Heath					1																				1
Small Tortoiseshell	3							3	1	1								1			1			13	
Small White		3	5		4		1				3	1		12	24	26	24	27	22	43	34	18	10	33	290
Small/Essex Skipper											5	9	11	84	73	55	32	19	7	3	4	1			303
Speckled Wood		2	1		2	1				1							2	3	2	1	2	1		3	22
Grand Total	9	15	13	5	16	15	17	12	6	32	59	74	131	333	295	254	170	135	94	93	74	46	63	133	2094

Kingfisher	1	1								1
Green										
woodpecker	2	1		1	1	1	2			8
Gt spotted										
woodpecker	2			1		1	2			6
Woodlark*										0
Skylark *		1			1		2			4
Swallow						1			1	2
<i>Meadow Pipit</i>										0
Pied wagtail						1	1		1	3
Wren	49	10	7	6	8	6	6			92
Duncock*	8	1	4	6	3	1	6			29
Robin	19	5	2	8	7	4	8			55
<i>Nightingale</i>				1		1				2
Stonechat										0
Blackbird	12		5	3	5	5	7			37
Song thrush*	5			1						6
Mistle thrush	1									1
Cettis warbler	14	6			3					23
Sedge warbler	14	8			4					26
Reed warbler	4	3								7
Lesser whitethroat							1			1
Whitethroat	5	3	2	2	4	1	2			19
Garden warbler	9	1								10
Blackcap	14	3		3	3		6			29
Chiffchaff	20	4	1	4	3	2	6			40
Willow warbler	3	2								5
Goldcrest	1	5								6
Long tailed tit	6	2		2	2		2			14
Marsh tit*	5				1					6
Coal tit	7	3		3		1	2			16
Blue tit	54	5	7	11	5	5	5			92

Great tit	25	2	8	7	2	4	6	54
Treecreeper	5			1	1			7
Jay						1	1	2
Magpie				1		1	1	3
Jackdaw							1	1
Carrion crow							1	1
House sparrow*					6	6		12
Chaffinch	34	18	20	7	12	15	10	116
Greenfinch	1		5		2	1	1	10
Goldfinch	5	5				1	3	14
Linnet*			2	1	1	4	1	11
Bullfinch*			1					1
Yellowhammer*	1		1			1	2	5
Reed bunting *	1	2			1			4

Species marked + = no specific survey

Species marked with an asterisk* = Birds with UK and Suffolk Biodiversity Action Plans

Sizewell Breeding Birds 1999 - 2011

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Annual trends	Local	UK
														Mean		
Little Grebe	2	2	2	2	2	1	1	1	1	1	0	1	0	1.2	-	-
Grey heron	0	0	0	1	2	0	0	1	1	1	1	1	1	0.7	0	+
Mute Swan	4	4	4	4	5	3	7	5	5	4	6	4	2	4.4	-	+
Greylag goose	0	0	3	0	0	2	0	0	1	1	0	1	0	0.6	0	+
Canada goose	0	1	3	0	1	3	1	2	2	1	1	2	1	1.4	0	+
Shelduck	1	0	0	0	0	0	0	0	0	0	1	2	3	0.5	+	+
Gadwall	8	6	6	8	8	7	5	8	11	7	5	4	4	6.7	-	-
Teal	2	0	0	1	1	0	1	1	1	1	0	0	0	0.6	-	-
Mallard	32	19	17	40	37	23	28	20	24	26	15	20	17	24.5	-	+
Shoveler	1	0	1	0	0	3	1	1	1	0	0	0	0	0.6	-	-
Tufted duck	0	0	1	0	1	2	1	1	4	4	3	1	1	1.5	-	+
Sparrowhawk	2	1	3	3	2	2	0	1	1	3	2	1	2	1.8	+	-
Kestrel	2	2	3	2	2	2	0	0	1	1	1	1	1	1.4	-	-
Hobby	1	0	1	0	0	0	1	0	1	2	1	1	1	0.7	+	+
Red legged partridge	4	3	4	4	8	11	6	3	4	3	1	4	2	4.4	-	-
Grey partridge	1	0	0	1	1	0	0	0	0	0	0	0	0	0.2	-	>50%
Pheasant	6	6	11	11	4	17	7	3	8	8	1	5	4	7.0	-	+
Water rail +	2	1	1	1	1	8	1	3	6	8	nc	3	1	2.8	0	0
Moorhen	28	26	32	29	36	51	53	31	36	45	32	34	22	35.0	-	+
Coot	3	3	3	1	1	2	0	0	0	1	2	2	1	1.5	-	+
Ringed plover	1	0	0	0	0	0	0	0	0	0	0	0	0	0.1	-	>25%
Lapwing	2	2	1	1	1	0	0	1	1	0	0	3	1	1.0	0	-
Oystercatcher	0	0	0	0	0	0	0	0	0	0	1	0	0	0.1	0	0

Redshank	1	1	1	1	1	0	0	0	0	0	0	0	0	0.4	-	-
Stock dove	1	1	3	5	4	4	1	4	3	4	6	3	4	3.3	+	0
Collared dove	0	0	0	0	0	1	1	1	0	3	1	3	1	0.8	+	+
Turtle dove	2	0	6	0	6	2	1	3	2	1	2	1	1	2.0	-	>50%
Cuckoo	2	1	2	2	1	2	1	1	2	2	2	1	1	1.5	-	>25%
Tawny owl	3	0	0	1	1	1	0	2	0	0	2	2	0	0.9	0	+
Barn owl	1	0	0	0	0	1	2	1	1	0	0	0	1	0.5	+	+
Little owl	2	0	1	0	1	0	1	0	1	1	0	1	0	0.6	-	>25%
Kingfisher	1	1	1	1	1	1	1	1	1	1	1	1	1	1.0	0	-
Green woodpecker	4	3	2	3	3	4	6	3	5	6	6	7	8	4.6	+	+
Gt spotted woodpecker	3	3	1	6	5	5	4	9	4	3	7	5	6	4.7	+	+
Lesser spotted woodpecker	0	1	0	0	0	0	0	0	0	0	0	0	0	0.1	-	-
Woodlark	6	3	5	2	5	4	3	3	2	1	0	0	0	2.6	-	>50%
Skylark	12	6	16	29	19	23	15	16	14	15	9	7	4	14.2	-	-
Swallow	2	0	0	0	2	0	2	2	0	0	2	1	2	1.0	0	0
Meadow Pipit	0	0	0	6	4	2	3	1	0	1	1	1	0	1.5	-	-
Pied wagtail	3	2	2	1	1	1	2	1	2	2	3	1	3	1.8	+	0
Wren	117	127	125	136	132	143	181	134	159	147	137	112	92	134.0		+
Duncock*	19	18	27	37	35	25	34	27	43	29	21	24	29	28.3	0	>25%
Robin	24	47	59	84	84	66	64	88	101	97	78	89	55	72.0	0	+
Nightingale	3	1	0	0	1	1	1	1	1	2	2	3	2	1.4	+	-
Stonechat	0	0	0	4	3	4	0	0	0	0	0	2	0	1.0	-	+
Blackbird	30	33	33	37	37	31	31	25	46	41	29	36	37	33.5	+	-
Song thrush	2	1	3	3	3	3	1	2	4	12	5	6	6	3.9	+	>25%
Mistle thrush	1	3	4	3	3	5	1	1	3	2	1	1	1	2.2	-	>25%
Cettis warbler	0	1	1	4	4	7	19	11	14	20	13	21	23	10.6	+	+
Grasshopper warbler	1	1	0	0	0	0	0	0	0	0	0	0	0	0.1	-	>50%
Sedge warbler	23	18	41	35	29	34	32	21	25	23	22	10	26	26.1	0	-

Reed warbler	26	24	33	25	29	34	21	30	32	32	21	29	7	26.4	-	+
Lesser whitethroat	1	0	1	1	3	2	2	3	7	1	3	3	1	2.1	-	0
Whitethroat	19	8	21	28	20	24	39	33	26	30	20	16	19	23.3	-	>50%
Garden warbler	15	11	23	8	10	12	11	20	26	13	5	6	10	13.1	0	-
Blackcap	23	14	19	31	14	20	26	31	25	17	26	32	29	23.6	+	+
Chiffchaff	22	31	25	52	62	73	40	39	45	55	47	44	40	44.2	+	+
Willow warbler	11	7	14	8	5	5	4	2	3	3	5	1	5	5.6	-	-
Goldcrest	0	1	1	0	3	3	0	4	1	2	0	2	6	1.8	+	+
Spotted flycatcher	1	1	0	1	0	0	0	1	1	0	0	0	0	0.4	-	>50%
Bearded tit	0	0	0	0	0	0	0	0	1	0	0	0	0	0.1	-	-
Long tailed tit	9	6	6	10	7	14	12	21	12	21	13	18	14	11.8	+	+
Marsh tit	3	2	3	7	3	1	0	2	3	2	3	5	6	3.1	+	>50%
Coal tit	32	29	13	32	44	41	56	30	13	15	10	6	16	25.9	-	+
Blue tit	32	29	13	32	44	41	56	49	50	61	41	44	92	44.9	+	+
Great tit	39	27	17	42	49	43	62	67	51	41	50	56	54	46.0	+	+
Treecreeper	3	1	3	4	5	4	1	4	2	2	0	6	7	3.2	+	-
Jay	2	2	3	2	2	3	2	3	3	2	3	2	2	2.4	0	+
Maggpie	4	5	4	6	2	3	2	4	3	5	4	1	3	3.5	0	-
Jackdaw	6	27	2	7	11	12	3	9	5	7	6	8	1	8.0	-	+
Carrion crow	4	3	4	2	1	5	1	1	1	2	2	0	1	2.1	-	+
House sparrow	nc	nc	nc	nc	4	7	4	8	12	15	8	8	12	8.7	+	-
Chaffinch	50	88	111	140	136	128	155	161	138	141	134	147	116	126.5	0	+
Greenfinch	3	2	5	6	5	7	8	3	13	13	7	10	10	7.1	+	+
Goldfinch	1	0	1	1	4	4	5	8	7	4	6	7	14	4.8	+	+
Linnet	20	9	20	7	8	13	5	9	6	5	8	8	11	9.9	-	-
Lesser redpoll	0	0	0	0	0	1	0	0	0	0	0	0	0	0.1	0	+
Bullfinch	0	1	0	1	1	2	0	0	1	1	0	2	1	0.8	-	>25%
Yellowhammer	0	6	2	3	3	5	2	7	3	2	0	3	5	3.2	+	>50%
Reed bunting	5	5	12	7	9	12	12	12	12	9	8	8	4	8.8	-	-

No. territories	696	687	785	972	982	1026	1049	1001	1044	1031	853	900	853	913.8
No. species	66	57	40	60	67	60	58	63	65	63	58	65	62	60.3

Species in bold are declining nationally

BIODIVERSITY ACTION PLAN PERFORMANCE INDICATORS

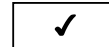
Positive
Outcome
✓ X

Habitats

Coastal Grazing Marsh

1) The extent of coastal and flood plain grazing marshes.

- No loss of grazing marsh habitat has occurred; the area remains as 2000 baseline at 85ha.



2) The diversity of aquatic vascular plants.

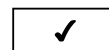
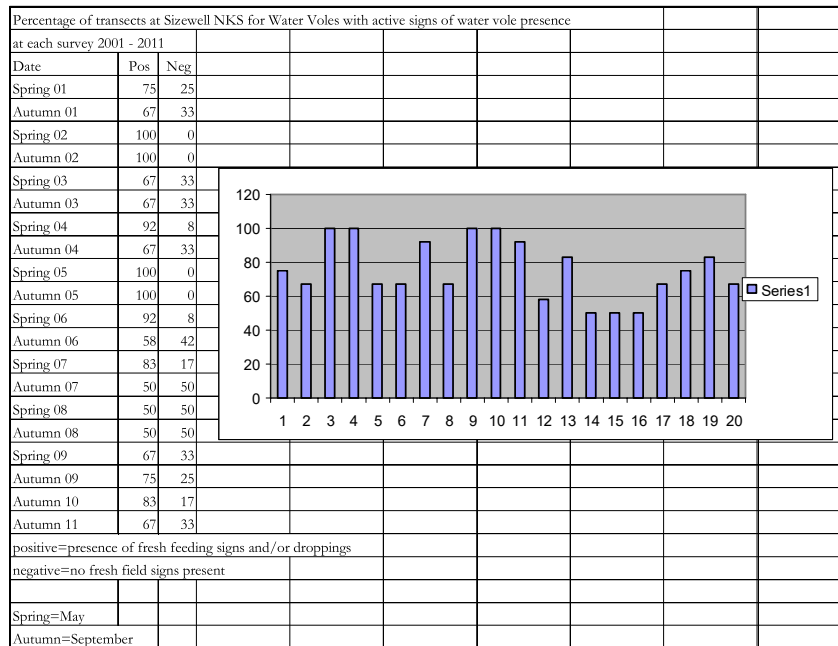
Number of species recorded 1998 = 43
2006 = 75



Survey not repeated since.

3) Maintain the water vole population.

Percentage of transects at Sizewell NKS for Water Voles with active signs of water vole presence at each survey 2001-20011

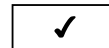


Positive
Outcome
✓ X

4) Changes in the numbers of breeding and wintering waders and wildfowl.

Numbers of breeding wildfowl and waders

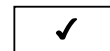
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Little Grebe	2	2	2	2	1	1	1	1	1	0	1	0
Grey Heron	0	0	1	2	0	0	1	1	1	1	1	1
Shelduck	0	0	0	0	0	0	0	0	0	1	2	3
Gadwall	6	6	8	8	7	5	8	11	7	5	4	4
Teal	0	0	1	1	0	1	1	1	1	0	0	0
Mallard	19	17	40	37	23	28	20	24	26	15	20	17
Shoveler	0	1	0	0	3	1	1	1	0	0	0	0
Water Rail	1	1	1	1	8	1	3	6	8	0	3	1
Moorhen	26	32	29	36	51	53	31	36	45	32	34	22
Coot	3	3	1	1	2	0	0	0	1	2	2	1
Lapwing	2	1	1	1	0	0	1	1	0	0	3	1
Redshank	1	1	1	1	0	0	0	0	0	0	0	0
Greylag Goose	0	3	0	0	0	0	0	1	1	0	1	0
Tufted Duck	0	1	0	1	2	1	1	4	4	3	1	1
TOTAL	60	68	85	91	97	91	68	87	95	59	72	51



Positive
Outcome
✓ X

Numbers of wintering wildfowl and waders

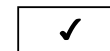
	Peak counts on any one visit									
	2001 -02	2002 -03	2003 -04	2004 -05	2005 -06	2006 -07	2007 -08	2008 -09	2009 -10	2010 -11
Little Grebe	1	1	1	1	2	1	2	2	1	1
Grey Heron	7	7	5	5	7	6	4	3	4	4
Mute Swan	27	21	19	17	14	12	14	11	10	11
Greylag Goose	104	104	23	172	177	95	16	152	87	77
Wigeon	350	350	30	68	75	66	27	60	36	59
Gadwell	52	59	50	36	66	97	84	54	60	19
Teal	109	148	72	72	47	54	69	117	58	39
Mallard	96	113	106	158	80	83	49	66	62	36
Shoveler	7	7	2	8	2	0	2	4	4	2
Water Rail	3	2	2	3	2	1	2	3	1	4
Moorhen	24	24	37	37	16	12	18	14	17	10
Oystercatcher	1	1	2	2	2	1	0	2	0	0
Snipe	24	24	39	39	20	3	11	21	18	9
Curlew	11	11	17	25	17	0	0	1	0	1
European White Fronted Goose	66	1	43	0	0	0	0	0	0	0
Little Egret	0	0	0	0	0	1	1	2	1	2
Barnacle Goose	0	0	0	0	0	1	0	0	6	100



Fen

1) The overall extent of fen habitat.

- No loss of fen habitat has occurred; the area remains as 2000 baseline, ie 7.5ha.



2) Breeding numbers of reed bunting, reed, sedge and grasshopper warbler.

Numbers of breeding reed bunting and warblers

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Reed Bunting	5	12	7	9	12	12	12	12	9	8	8	4
Reed Warbler	24	33	25	29	34	21	30	32	32	21	29	7
Sedge Warbler	18	41	35	29	34	32	21	25	23	22	10	26
Grasshopper Warbler	1	0	0	0	0	0	0	0	0	0	0	0



Positive
Outcome
✓ X

Lowland Heathland and Dry Acid Grassland

1) Numbers of breeding woodlark.

1999	6
2000	3
2001	5
2002	2
2003	5
2004	4
2005	3
2006	3
2007	2
2008	1
2009	0
2010	0
2011	0

X

2) The frequency/cover of key heathland floral species.

Vegetation surveys have been undertaken in 2000, 2004 and 2010 of the arable reversion field at Retsoms. Following sulphur treatment on part of the field as a means of reducing the pH, survey plots were established to compare the development of vegetation on the treated areas with the untreated part of the field.

The survey report concluded that the addition of sulphur and heather litter in the treated areas has produced heather-rich swards which, with the continuance of sustained management, are developing towards grass-heaths and, where building heather establishes high shade levels, into heather stands. The untreated areas, where management is coupled with summer droughting, can be expected to develop towards a grassland sward typical of dry, mildly acid conditions. SWR controlled broome in Summer 2011.

✓

Positive
Outcome
✓ X

Reedbed

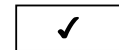
1) Extent of reed bed.

- No loss of reed bed habitat has occurred; the area remains as 2000 baseline, ie 6.5ha.



2) Numbers of breeding reed bunting and water rails.

	Reed Bunting	Water Rails
1999	5	2
2000	5	1
2001	12	1
2002	7	1
2003	9	1
2004	12	8
2005	12	1
2006	12	3
2007	12	6
2008	9	8
2009	8	0
2010	8	3
2011	4	1



Vegetated Shingle

Detailed vegetation surveys of the foreshore in front of both B and C stations were carried out in 2009 by both Entec and Suffolk Wildlife Trust. These will provide a baseline for future surveys depending upon the new build proposals.

Species

BAP Species Monitoring:

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Water Vole	R	R	R	R	R	R	R	R	R	R	R	R
Otter	R	R	R	R	R	R	R	R	R	R	R	R
Brown Hare	R	R	R	R	R	R	R	R	R	R	R	R
Skylark	6	16	29	19	23	15	16	14	15	9	7	4
Grey Partridge	0	0	1	1	0	0	0	0	0	0	0	0
Linnet	9	20	7	8	13	6	9	6	5	8	8	11
Reed Bunting	5	12	7	9	12	12	12	12	9	8	8	4
Song Thrush	1	3	3	3	3	1	2	4	12	5	6	6
Natterjack Toad	-	-	-	-	-	-	-	R	R	R	R	R

R = Recorded as present

